The Glass Industry
REG. U. S. PAT. OFF.

Vol. 10 JUNE, 1929 No. 6

The Progress of Glassmaking *in the States*

By PROFESSOR W. E. S. TURNER
Honorary Secretary,
The Society of Glass Technology

THE Editor of THE GLASS INDUSTRY has invited me to write for him a brief article telling something of my experiences during the visit which I have been privileged to pay to glass plants in the States in recent weeks. Before I attempt, however, to say anything of what I have seen I feel I would like to express my thanks very heartily and very appreciatively to the many friends on this side whose kindness to me has been exceedingly generous. I return to England with a keener sense than ever of friendship with colleagues on this side and go back with some feeling of encouragement because of the appreciation shown on this side towards the work we are attempting to do in the Department of Glass Technology and the Society of Glass Technology. There are some of my friends whom I have not been able to visit on this occasion; there are invitations which, although very attractive indeed, I have not been able to accept owing to the limitations of my time and the need for returning to England to fulfill engagements. To all friends with whom I have been unable to establish contact I offer my sincere regrets and express the hope that the time may not be too far distant when we can meet.

I came to this country in the happy position of having committed myself to no engagements, that is to say I came as a student once more, eager to meet my fellow glass technologists and glass manufacturers; to exchange views and ideas and to tell something of what we are attempting to do in England as well as to learn as fully as possible what progress had been made in the States since my last visit in the Fall of 1924. On this occasion it has been my privilege to visit plants of all kinds making a great variety of ware from glass marbles to big gasoline cylinders and included were a number of plants making sheet glass of various types by various processes, glass containers of all kinds and domestic and artistic glassware.

The changes since 1924 have, in my view, been distinctly of a more far-reaching character than in the preceding four years, namely, from those from 1920 to 1924. The changes have been both evolutionary and revolutionary. By evolutionary changes I mean those resulting from the intelligent and steady improvement in the nature of the glasses employed or in the operation of machinery. Revolutionary changes are to be seen in the production of electrically-fused refractory blocks and in the design and operation of the wonderful bulb-making machine of the Corning Works. There has been a considerable expansion of mass production glass for domestic purposes and the variety and cheapness of glass now obtainable in the five and ten cent stores is indeed remarkable. With some lines in particular I have wondered how the articles could be produced for the money. Articles for example such as light-walled tumblers gilded at the edge and sometimes also with a second gilt band. These lines of domestic ware selling at so remarkably low a price are no longer confined merely to flint glass but include colors. In particular an emerald green and a rose color are not only made in tank furnaces for hand operation but in some cases also are manipulated by automatic machines.

I have been much pleased with the very tasteful designs of the Fostoria glass and the way in which glass is becoming sought after and used instead of china for the table. The artistic ware of the Vineland Flint Glass Company is an interesting development and shows that there is an increasing appreciation in the States of glass for decorative purposes. As for my friend, Mr. Frederick Carder of the Steuben Division of the Corning Glass Works it is remarkable how fertile he remains in the creation of new designs of artistic ware in the highest realms of the glassmaking art. One of my disappointments when visiting the Metropolitan Museum of Art in New York was that I did not find any examples of Mr. Carder's work. That is a position which certainly ought to be rectified in view of the presence in the Museum of specimens of contemporary European glass.

Turning now to particular themes I would like to com-

ment in turn on the subjects of batch composition and the treatment of the batch, refractory materials, melting furnaces, glass feeding devices, forming machines, processes for making sheet glass and finally the more general application of technical knowledge.

I find that in the last four and a half years steady improvement has been taking place in the composition of glass for use for glass containers and other varieties of glass. In 1924 I found that many factories making flint glass were content with a glass containing less than 8 per cent of lime and magnesia and with a soda content of 17 per cent or more. There was a recognition certainly by one or two firms of the value of running 9 per cent of lime and magnesia in glass milk bottles and a few firms were beginning to realize the advantage of a little added alumina. An improvement has taken place since then in that the total lime and magnesia content has been raised and the soda content has been somewhat reduced. A wider-spread use of feldspar to provide up to about 2 per cent of alumina in the glass is noticeable and, in addition, experiments have been carried out by some firms on the use of barytes and of borax. I do not find it possible to pass a verdict on the conflicting opinions based on the results with barytes, although the balance of evidence is not unfavorable. Manufacturers do not always realize that the success of a specific material introduced into the batch must necessarily be influenced by the composition of the original batch. In the case of borax, success has been fairly general where it has been used intelligently. The general result of these various changes has been that glass containers nowadays are being produced with a lower soda content than at any time previously since the introduction of gravity-fed machines and a substantial improvement has accordingly taken place in the durability of the ware. Filming during storage is no longer so common a defect as it used to be.

Whilst I find practically no change in the machinery used for mixing the batch there is a keener perception of the factors which influence the homogeneity of the batch. It is more fully realized now that it is important not only that the batch shall be thoroughly mixed when delivered from the mixing machine but that it shall be still thoroughly mixed when it is charged into the furnace, and various devices are in use in different plants with a view to overcoming the troubles due to segregation. Cullet is now very much more frequently crushed and mixed in with the batch although all manufacturers are not quite in agreement with the advantage of this operation. Quite a number of factories are now equipped with devices for the charging in automatically of batch into the furnace and with but one or two exceptions this automatic charging appears to have worked very satisfactorily. In other factories an attempt is being made to safeguard against segregation of the materials by charging a complete mixing of batch into a small hopper which is conveyed to the doghouse and completely discharged. This process results in the whole of the glassmaking materials being charged into the furnace at a single operation.

I do not find many manufacturers on this side who use batch in a slightly moist state such as is general practice with batch fed to tank furnaces in England. Our own experimental work has undoubtedly shown that a little moisture is of advantage not only in keeping down dust but also in maintaining homogeneity of the batch. In the case of batches made up with soda ash, up to 2 per cent of moisture appears to be sufficient for this purpose. A salt cake batch can carry without disadvantage between 3 and 4 per cent. I ought to remark that in England the principal raw material, namely, sand, seldom arrives at the factory in anything but a moist condition, so that manufacturers there of mass production glass have no choice but to use batch with a small percentage of moisture since it is not easy to dry sand in bulk. This accidental circumstance of moist sand is one which works rather to the advantage than detriment of the batch provided the moisture is kept within certain limits. In America sand is delivered in a drier condition than is usually the case in the writer's own country.

Turning now to refractory materials, the changes in methods of pot making in the last four or five years have been of a very minor character. Outside the Glass Division of the Department of Commerce Bureau of Standards I find practically no tendency to use the casting process which was very much discussed about ten years ago and was to some extent then used commercially; nor has any other forming process such as the continental method of beating up the clay in a mold come into use as far as I have been able to ascertain. It may be, however, from what I have had the privilege of seeing, that one of these days—perhaps before very long—the pot maker may also be put out of his job, not by the casting process but by a machine which works on rolls of clay as does the pot maker at the present time. Perhaps also the pot cast from electrically-fused mullite will help to diminish the number of glasshouse pot makers; but for the time being both the demand for and the problems which have arisen out of the manufacture of cast mullite blocks have prevented any time being devoted to the development of the cast pots of electrically-fused mullite.

There is one tendency which to me has been noteworthy, namely, the creeping back of foreign clays into the materials which the pot makers employ. At one time between 1920 and 1924, pot makers had come to rely almost entirely on American clays. Several prominent firms still find they can meet the whole of their requirements from native sources. It has therefore been of interest to me to note the use by several refractory materials manufacturers of a certain proportion of foreign clays.

Of special refractory materials much has been said and much has been written during the past four and a half years, particularly refractory materials using sillimanite, andalusite and mullite. For glassmaking purposes I find that the introduction of some of these materials has lagged behind the discussion devoted to them. Sillimanite for example made up into articles with a bond have got little beyond the experimental trial stage and indeed, so far, none of the larger products made by bonding sillimanite and andalusite or mullite with some plastic material appears to have proved an entire success in the parts of the furnace devoted to melting. Experiment, however, is still proceeding in the hands of several refractory manufacturers and it may be that before long, bonded sillimanite or mullite refractories

may have a definitely established value. Everyone recognizes that the great difficulty lies in applying a successful bond. It is not so generally recognized that firing to high temperature is essential to the successful use of these products. It cannot be too frequently emphasized that this is necessary.

Very naturally the progress of the electrically-fused and cast mullite blocks made by the Corhart Company has been a subject of very great interest to many and I have sounded the opinions of many factories as I have travelled about the country, whilst I have also had the privilege of seeing on the spot the process of manufacture and of realizing something of the problems which still have to be solved. Some of the hopes which were entertained for the fused mullite block have not yet been realized. The complete insulation of the walls of a glass melting tank has not been found possible even with the Corhart block although it can apparently be done to a certain degree. For example I have seen the melting end of a tank in which the Corhart blocks constituting the wall were insulated with the exception of the top six inches, and these were cooled in the ordinary way. The scheme in this instance appeared to be working satisfactorily. In another case the blocks are being insulated with the exception of the joints and these are being air cooled. The results in this test are not yet available. The Corhart blocks also have not been found to be equally successful with all types of glass. With borosilicate glasses, for example, the blocks of the compositions hitherto made have been disappointing but other compositions are being tested which promise better performance. There is no doubt whatever, however, that Corhart blocks have been proved of greater durability in the melting of lead oxide containing glasses and in the manufacture of window glass than the best fireclay blocks hitherto obtainable. I have also seen a green bottle glass tank with flux line and throat blocks of Corhart which resisted corrosion so successfully during the tank life that they will be used for the next run save for a slight lowering of glass level. Particularly has the Corhart block been of value in window glass melting tanks. The life of the upper course of blocks has been extended anywhere from 50 to 75 per cent over the life of corresponding fire clay blocks and there has been a very much greater freedom from stones. In one or two instances I have seen the ingenious device applied of lowering gradually the level of the glass in a tank in order to extend its life. This device is not always applicable but in cases where the working processes admit of changing the glass level the method seems to be capable of extending tank life and of giving efficient results so long as the other parts of the furnace, the regenerator and the ports, still remain in reasonably good condition.

Experiments with furnace building have also begun to be interesting in this period since 1924. The ordinary cross-flame type still easily predominates especially for large purposes. End-port furnaces with recuperators have, in several plants which I have visited, been giving very efficient service and I have had the advantage of noting a variety of experimental tanks L shaped and U shaped. Some manufacturers are experimenting with tanks possessing no bridge. On the other hand one sheet glass company is using a bridge wall and a throat in its glass melting furnaces, a noteworthy departure from the orthodox sheet glass melting tank which has hitherto divided its melting from its refining end only by floaters. In no case as yet of these newer types of furnace can I ascertain general agreement on their advantages and I have received conflicting reports. Here again it has to be remembered that a tank which will suit the class of trade at one plant may be unsuitable for another. Only a detailed balance sheet for the tank showing all charges could enable a decision to be reached. It has to be borne in mind, however, that the end-port tank or the cross-flame type of tank of substantial dimensions still holds the one important advantage over the smaller special types such as the L and the U shaped types in that their proportionate loss of heat by radiation is less, their surface area being smaller per unit weight of glass content. This advantage in regard to heat efficiency will be maintained until insulation both of the melting as well as the working end of a tank furnace becomes a practicable proposition.

Glass feeding devices appear to have undergone but little change during the period to which this review has reference. This does not mean to say that greater efficiency and more flexibility in their adaptation to new types of glass have not taken place. It is certainly something new in recent years that two streams of glass of different character may be discharged simultaneously through the orifice of a feeder; and glasses of higher viscosity are now being discharged through feeding devices than was the case four years ago. All these indicate an improvement in technique, even if no revolutionary change has occurred.

Turning to glass forming machines, the old types of gravity-fed machines, whether blowing or press and blow machines, seem not to have changed substantially and this also applies to the Owens machine although the use of multiple molds has extended. I find very great interest taken by manufacturers in the new Knox-O'Neill machine built by the O'Neill Machine Company, and its successful use of the suction process for charging the parison mold, the glass being gathered from a fixed trough and not from a revolving pot. From what I have seen of this machine and from my conversation with a number of others who at different times have also had the opportunity of inspecting it the machine is undoubtedly a noteworthy contribution to glass-forming processes. It consists of a double table machine somewhat after the plan of the No. 40 series of the O'Neill machines, but the parison mold table carries parisons which as the table rotates dip down into a trough and suck up the charge of glass required. Each table carries six molds. At the fourth station the parison is transferred to the finishing mold by the same type of device as that in operation on the No. 40 series of the O'Neill machines. Each finishing mold is provided with a separate blow head. The parisons were regularly formed and although the cut off or shear mark is still a little ugly it has certainly been improved since the earlier days of the experiments and will probably be further improved. On the occasion when I saw the machine it was making approximately 30 three-ounce bottles per minute and was stated to give normally between 32 or 33 per minute. My

own visit to the plant was paid early on a Monday afternoon.

Whatever may happen when the machine, or a new form of it, is called on to make heavier ware, for example running up to 16 or 32 ounces, or whatever may happen when a series of machines are placed at a single furnace, it still remains a fact that this particular machine, designed and operated on small ware, is a success.

It has been my privilege to see two other machines of outstanding character, namely, the wonderful machine designed and built by the Corning Glass Works for the manufacture of electric bulbs. This machine is amazing in the apparent simplicity of operation and because of its enormous speed. The production is so great that one of the real difficulties has been to cope with the bulbs as they are discharged from the machine. A ribbon of glass is rolled so as to produce a series of thickened blobs of glass distributed down its length and each of these blobs forms a nucleus which is blown up into a bulb by a series of blow heads carried on a belt, and finally finished by blowing into molds which are carried on a continuous belt. After viewing this machine one certainly feels that there is no limit to the ingenuity of the engineer in dealing with molten glass.

Forming machines for electric bulbs are also undergoing change along more or less orthodox lines. The Westlake machine has been so modified that its weight has been reduced to about one-fourth or one-fifth of the original weight. The Ivanhoe machine for example seems but a pocket edition of the original 24-arm machine yet it is fully equipped and has made nearly 90,000 bulbs in the day. The introduction of a single ram has improved working operation and enabled efficiency to be raised in the standard type so much so that the production has on occasion exceeded 100,000 per day. The latest departure is a machine with 48 arms which is fascinating by reason of its great circle of bulbs in various stages of formation.

Perhaps the manufacture of sheet glass is the one in which the most substantial changes are being made at the present time. When I visited the States in 1924 the Libbey-Owens process had become thoroughly established but the Fourcault process had given rather disappointing results. It appears that the companies which in early days attempted to operate the Fourcault machines had no real grasp of the intricacies of the process and consequently came to grief. If there is one thing more than another which satisfied me about the progress of the vertical sheet glass process as it is being conducted today in the States it is that those who are operating it have come to entertain a great respect for the difficulties which the process involves and have begun to undertake systematically and intelligently a review of all the different factors with the object of getting them substantially under control. The subject of the homogeneity of the glass, the fundamental condition to success, is being more and more realized. The design of the drawing tank and the control of temperature in that tank are all being subjected to inquiry with the result that now I think it not too much to say that the vertical sheet process as carried on in the United States does not lag behind operation in Europe and may before very long take the lead. One of the adaptations of this process is, so far as I can gather from an inspection, so successful that it may modify very substantially or replace the earlier methods of operation which have been used in European countries. It was my privilege to see machines of this type at work drawing successfully sheets of 78 inches and 90 inches in width.

The laminated glass industry in the States is entirely a development of the period which I am reviewing. Seven companies making this glass have come to my notice. Such vigor is being displayed in the development of laminated glass that I found one company, which began manufacture only six months ago, had reached a production of some 7000 wind screens per day.

Concerning the process of annealing, the whole practice has been wholly changed since my last visit. In September, 1924, I had the opportunity of watching in Pittsburgh either the first, or one of the first, Hartford-Empire lehrs devised to anneal glassware commercially with little or no fuel expenditure. Since then, such nearly fuelless lehrs have become common practice. In one factory of modest dimensions I saw fifteen such lehrs. Of the various types now in use, I imagine there must be well over 300. Quite a new and more rational understanding of the annealing process has come about. I can illustrate this radical change of view by reference to an elderly glassmaker whose name and glassmaking reputation are held in great respect by myself and indeed, by all men over the States. He was really astonished that he could put a wide variety, large and small, cased and plain, of hollow ware at one time into one of these modern lehrs and get it all well annealed in the space of two hours. He does not cease to marvel, in view of the elaborate apparatus previously used and the elaborate theories formerly held. And in regard to the different types of lehr available, whatever criticism outsiders may make of any special design, I have found only very minor causes for criticism about any type from manufacturers actually using them. They have proved to be another great contribution of America to the science of glassmaking.

Finally I would like to add a word or two about the general outlook on technical matters. I understand, and all my observations have confirmed what has been told me, namely, that the glass manufacturers were never so ready as they are today to take into account the advice of the glass technologist and the scientific worker. In some lines of manufacture, particularly glass containers, the great increase in production and efficiency has led to much competition, a condition of affairs which holds good also in England. The result has been a continuous striving for still greater efficiency production and of improvement in quality, and in this quest has been the glass technologist's opportunity. It has been a very great pleasure to me to note the increasing number of graduate scientific workers who are becoming attached to the staffs of glassworks organizations. More and more the future of the glass industry lies in the hands of the trained glass expert. I have found in one factory that the order of factory operations involving the fulfillment of orders was decided, not in the office, but by the laboratory staff. Scientific control of this character had been found to have resulted in a rational procedure to the great advantage of the factory and not least to the workmen.

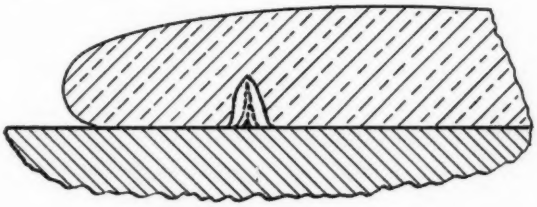
It was a source of real delight to myself when I heard that Dr. E. C. Sullivan, whose name has become famous throughout the world of glassmaking, had stepped up into the position of President of the Corning Glass Works. It gave an added status to all glass technologists, senior and junior, throughout the industry. I personally look forward within the next decade to the promotion of other scientific workers of suitable temperament to similar executive positions. Such a course should gradually lead to a true rationalization of the industry.

It should also lead to the greater expansion of glass in ordinary life because of the possibilities which the glass technologist can visualize for the material with which he works.

Pressing Glass

By ROY E. SWAIN[1]

AS a rule, glassblowers look upon pressers as being semi-skilled labor. This attitude no doubt is prompted by the fact that many pressers have learned their trade as adults, while very few men have become proficient as blowers who did not start their training when they were comparatively young. There are those however who have been fortunate enough to have had an opportunity to learn these two branches of the trade and from these we learn that, while there are many simple pressing jobs that require but little skill, taken as a whole the pressers have more problems of greater complexity than do the blowers. Many of the



presser's problems have not been solved by the presser alone but in conjunction with the mold maker and the mold designer, so it may be necessary to repeat here some of the subject matter used in discussing the topics brought under the subject of molds in earlier articles.

Standards of pressing equipment vary with the different factories or districts and to go into this subject would but bring out a mass of tedious detail so at this time pressing will be considered broadly. The first duty of the presser is to align the mold ring and plunger on the press. This is a very delicate task as not only must the mold ring and plunger be aligned on the same axis but the height of the plunger must be adjusted so that the plunger seats comfortably in the mold when the rocker arm is set on dead center. In many cases it is also necessary to align the mold, ring and plunger radially in order that the design may be produced exactly as planned. The molds are usually below good working temperature when first aligned. It is then often necessary to make adjustments to take care of the expansion of the molds as they become heated. To neglect this may permit the plunger to rub the ring on one side and throw all the clearance to the other side of the mold which may allow a flash or fin form. In a short time this condition will cause permanent damage to the ring and plunger. The mold equipment adjusted, the gatherer fills the molds with glass to heat them to a working temperature. When the molds approach that of a good working temperature the gatherings are pressed to work the molds hot.

It is seldom that two molds work exactly alike even when cast from the same pattern at the same heat and machined to the same templates so it is often necessary to work to a mean schedule rather than try to arrange the working schedule to any particular mold in the set. It is seldom possible to balance a set of molds so that the molds, ring and plunger will all receive just the required amount of heat from the glass. For this reason it is often necessary for the presser to devise cooling arrangements to get the best working conditions for his mold. There are also cases where it is necessary to supply extra heat as in the case of working a single mold the ring may work too cold unless placed in a heater when removed from the mold.

No small amount of the responsibility of the success of the press shop rests upon the gatherer and in some instances the gatherer and presser are held equally responsible and receive the same pay. The gatherer is not only expected to gather a clear piece of glass but must gather accurate weight and shape and so handle the viscous mass as to be able to place it in the proper place in the mold. While each gatherer has a style of his own, each factory or district usually standardizes a certain general style of gathering and although there may be little choice between the different systems, local pride usually protects the style in use against invasion from outside systems. Should the gatherer not gather the glass solid, that is free from surface irregularities, it is possible that air may be trapped between the glass and the mold or laps may be formed. Laps are made by folding the partly chilled skin of the glass and there are many ways of causing these folds.

The sectional view given above shows what happens when a loosely gathered piece of glass is placed in the mold. This is exaggerated in order to show the development of the lap as the two surfaces of the glass join on the face of the mold. In small deep articles the glass may strike the side of the mold and if the mold is working hot the glass will cling to the mold at this point and become prematurely chilled. In pressing, the hotter glass flows over this spot which may be described as a cold shot and a lap is formed about it. Another type of lap is formed by permitting the sheared end of the glass to fall beyond the body of the gathering. In very stiff glass or when the time between shearing and pressing is short, laps are sometimes formed on the upper surface of the glass. These usually consist of two converging laps connected by a shear mark.

[1] Engineering Dept., Macbeth-Evans Glass Company.

ABOVE—CHEMICAL LABORATORY
UPPER LEFT—CHEMICAL LABORATORY
LOWER LEFT—WORKSHOP

Glass Container *new research*

THE Glass Container Association now have their Research Laboratories located in new quarters at 39 West Thirty-eighth Street, New York City. This new location is centrally situated convenient to all transportation lines. A visit to the Laboratories is well worth the time of any executive, salesman, or plant operator engaged in the manufacturing or packing field of the glass container industry.

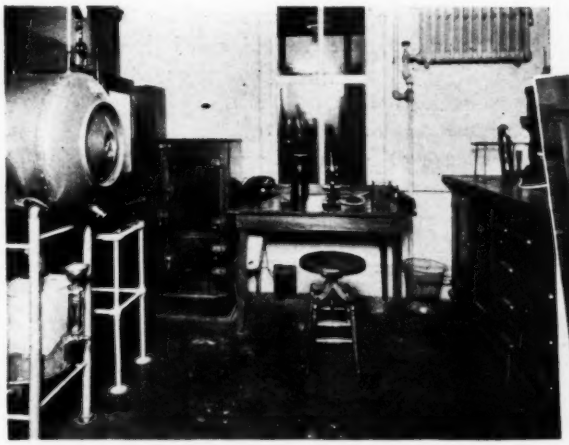
In these new laboratories the glass container industry has a splendid means for education, service, and research consistent with the progressive attitude it has shown toward industrial research through its Association activities. While this laboratory is primarily a research organization, a considerable part of its activities is purely educational and service. One can readily appreciate that the use of a glass bottle or jar for perishable food products or beverages must necessarily require a knowledge of the proper methods of food preservation and the prevention of spoilage. The user frequently through his own acts causes spoilage which unless corrected results in the use of another type of container. It may result in the discontinuance of that product. A packer may have a product he desires to pack in glass, but he knows nothing of the technique involved. The services of the Laboratories are available to these packers. Such services are given the packers without cost to them.

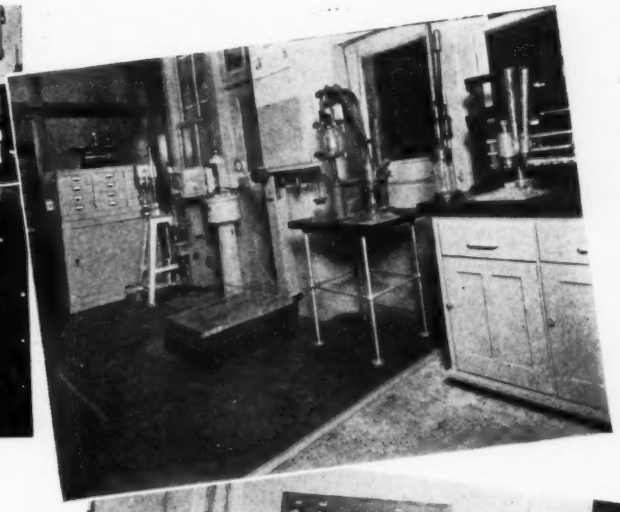
Many of these problems require facilities beyond the scope of the smaller industrial laboratories of the packing plants. In some cases it may be necessary to have the packer actually visit the Laboratories and receive instruction in the proper methods of handling his product. Occasionally the members of the staff visit the plants to inspect the equipment and give the necessary instructions to the plant operators.

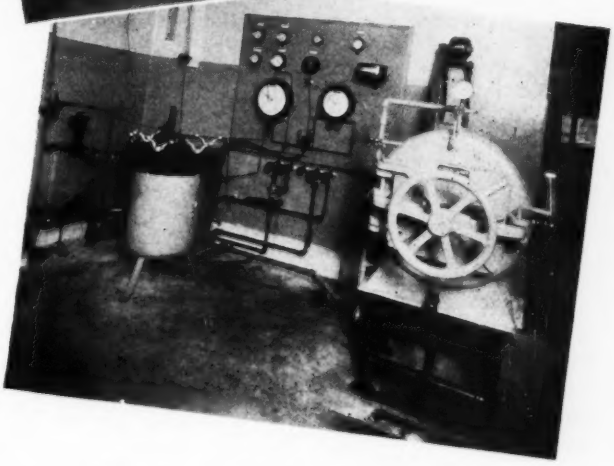
These activities of the Laboratories are directly connected with the increased sales program of the glass container industry. Whether the service rendered relates to new products or the improvement of products already on the market the results are for the benefit of the industry. How effective these results will be for any individual company depends upon the extent to which that company uses the facilities of the Laboratories.

From a personal visit to the Laboratories is gained an appreciation of the extensive use of the glass container. It embraces food products of all description from the simple vegetables to delicacies of rare flavor. Beverages of many varieties both artificial and real fruit flavors are bottled in containers from gallon jugs to bottles holding but a few ounces. Fruits are packed in many different ways. There are pharmaceuticals, toilet preparations, chemicals, and numerous other separate products which make the list seem endless. Very likely no one person knows them all.

When one realizes the extensive use of the glass container and learns of the range of the service problems handled by these Laboratories the extensive scope of its activities becomes apparent. There can be no manufacturer of glass containers to whom the glass Container Research Laboratories is not of some assistance either directly or indirectly because







ABOVE—BACTERIOLOGICAL LABORATORY.
UPPER RIGHT—PROCESS ROOM, CAPPING MACHINE.
LOWER RIGHT—VERTICAL RETORT, AGITATING STERILIZER, CONTROL INSTRUMENTS.

Association . . . *laboratories*

of the service rendered in so many widely different fields.

One activity of the Laboratories which deserves more than a brief mention is the so-called salesmen's conferences. In reality these are classes for salesmen in which the Laboratory staff functions as instructors in the art of food preservation as it applies to glass packed products. The purpose is not to develop fully trained food experts, but to acquaint them with the general principles of food preservation. The course covers bacteriology, food chemistry, closure operation, and the methods of pasteurization and processing. Each member of the staff handles the part of the instruction in which he is experienced. The instruction is given in the form of discussions and actual demonstrations of pasteurizer and retort operation.

The real purpose of the course is to enable the salesman to recognize the general principles involved in the packing of any product for which he sells glass containers so that he can appreciate the packers' problems. It has not been unknown in the packing field to have failure which can be directly attributed to a lack of knowledge of the salesman in his directions to the packer or selection of closure for the product. The salesman is also shown how spoilage may be remedied by some simple studies in the laboratory which locate the real source of the trouble and save a large amount of unnecessary loss due to plant experimentation.

In addition to these courses of instruction the staff of the Laboratories publish through the medium of the *Glass Container* or trade journals the results of studies made in the laboratories. These articles cover the solution of problems confronted by packers and new developments resulting from studies of defects in the methods in use at present.

The equipment of the Laboratories is complete and of the highest grade. The staff can handle delicate chemical determinations or duplicate on a small scale actual plant operations with equal facility. The facts obtained are as exact as scientific instruments will record them. Because of the high grade and completeness of the equipment the industry is assured that the problems will be studied from both a scientific and practical standpoint. This assurance helps to establish a feeling of confidence and goodwill between the glass industry and the packer.

The staff of the Laboratories are specialists in their fields. They function as a unit in the solution of problems presented to the Laboratories. Bacteriology, food chemistry, and engineering are the three fields covered by the staff.

A reference to the floor plan of the Laboratories gives a good idea of its completeness. There is a bacteriological laboratory equipped for the investigation of spoilage of food products through the growth of bacteria, yeasts and molds. Studies of thermal death point are made to determine the proper temperatures necessary to obtain the required sterility.

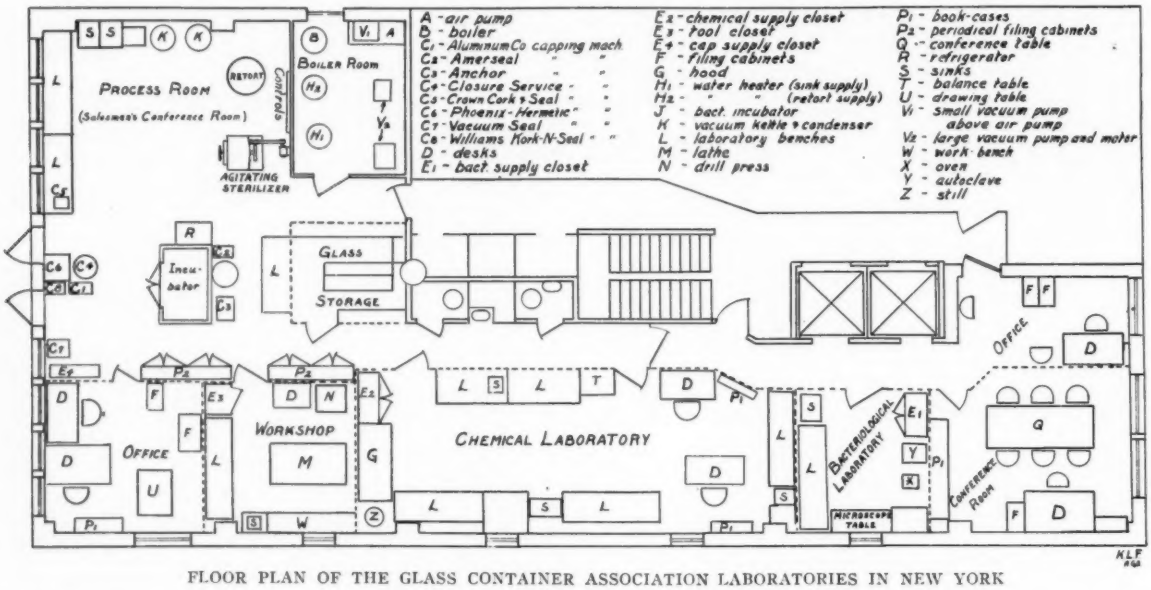
There is a chemical laboratory with a food chemist and assistant as the personnel. Problems of spoilage due to chemical causes are studied in this laboratory. Frequently the method of compounding the product may be at fault and

this phase of the problem may be handled in this laboratory.

The engineering department contains a small but well equipped machine shop, an office and drafting room, and a process room. This laboratory handles the engineering problems and develops apparatus of a mechanical nature necessary for the work. In the process room are located many different types of capping machines. With these machines it is possible to seal bottles and jars with the different closures employed for glass containers. These machines are also used for demonstration purposes. Some of these machines seal the jars under a vacuum.

The processing of glass containers can be accomplished in a small sized commercial retort or agitating sterilizer. Both of these pieces of equipment are of the latest type. Temperature and pressure controlling and recording devices are installed on the retort and pasteurizer. In addition a thermocouple installation of special design constructed in the laboratory enables the study of temperature changes within the jar during the complete process period.

Many manufacturers of equipment used in the packing industry but not members of the Association have loaned equipment for special studies. At the present time the Laboratories are engaged in a study of chocolate milk and for this purpose several companies have supplied a complete layout including mixing tank, filling machine, sterilizer, and all the necessary supplies for making the product.



FLOOR PLAN OF THE GLASS CONTAINER ASSOCIATION LABORATORIES IN NEW YORK

The Selection of Coal for Gas Producers

At a meeting of the Society of Glass Technology a paper by E. J. C. Bowmaker, B. Sc., and J. D. Canwood, M. Sc., was presented by Mr. Bowmaker who stated that laboratory tests were carried out on some two dozen coal samples and the results obtained compared with the performances of the coals in actual use in the producers.

In each case the usual proximate analysis was done, including moisture, volatile matter, ash, and fixed carbon. The methods used in these determinations were described. From considerations of the volatile matter values, the coals could be classified as camel, anthracite, and bituminous; the ash values determined the economic value of the coal; and the fixed carbon indicated whether or not the coal was likely to form a deep fire bed.

The sample of coal yielding the most satisfactory results in the producer was found to contain 36 per cent volatile, with an ash content of 3 per cent. The standard specification finally chosen was not more than 5 per cent ash; volatile matter between 35 and 38 per cent.

Many coals fell in this class, yet were unsatisfactory due to "caking." After much experimental work it was found that the determination of the amount of a coal dissolved out by treatment with boiling aniline in a Soxhlet extractor yielded results which were in agreement with the "caking" tendencies, determined in another set of experiments, and also from the producer action. Coals which were definitely classed as non-caking yielded aniline-soluble values below 6 per cent; while solubilities in aniline of over 10 per cent were definitely associated with non-caking coals. One exception only was encountered. A cannel coal yielded a solubility in aniline of 12 per cent.

Further investigations on the softening points and the ferric oxide contents of the ash yielded proof that in all cases but one the fusing points were proportioned to the iron oxide contents. The exceptional case was an ash containing 70 per cent ferric oxide.

The following specification was given for a good producer coal:

> Ash not to exceed 5%, volatile matter 35-38%; solubility in aniline not to exceed 7% under the conditions stated; the iron oxide content of the ash not to exceed 15%.

The last figure was liable to variation according to the method of working the producer.

The Physical Properties of the Glasses and Their Relation to the Composition*

The Mechanical Properties of the Glasses

By G. Gehlhoff and M. Thomas

(*Concluded from the May, 1929, issue*)

Impact Test

THE results obtained with our glasses in the impact tests (referred to in the May issue) are seen in illustrations 28 to 31.

Monovalent glass formers. The alkalies seem to increase the impact strength slightly (fig. 29). There was not a characteristic relation between potash and soda in mixed alkali glasses (fig. 29).

Divalent glass formers. With the divalent glass formers (fig. 30), it was very difficult to obtain data. CaO, ZnO, BaO, and PbO seem to have only a slight influence, while

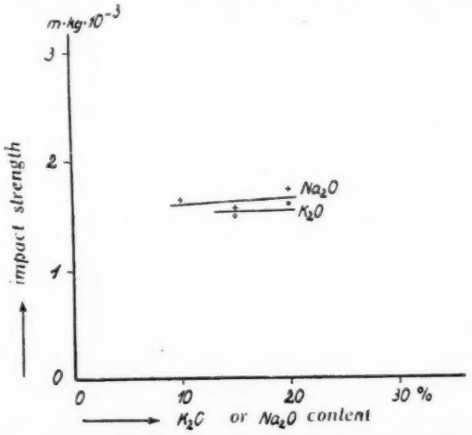


FIG. 28. THE IMPACT STRENGTH ON REPLACING SiO_2 BY K_2O OR Na_2O.

an addition of MgO up to 10% considerably raises the impact strength.

Trivalent glass formers. The only curve in which one can see a great change in the impact strength with varying composition, is that for the boric acid glasses (fig. 31). The impact strength increases considerably up to 15% B_2O_3 and

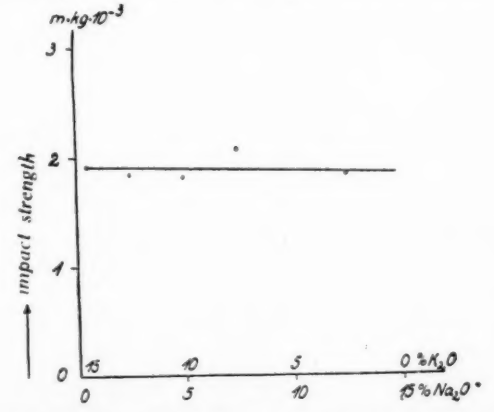


FIG. 29. IMPACT STRENGTH ON REPLACING K_2O BY Na_2O.

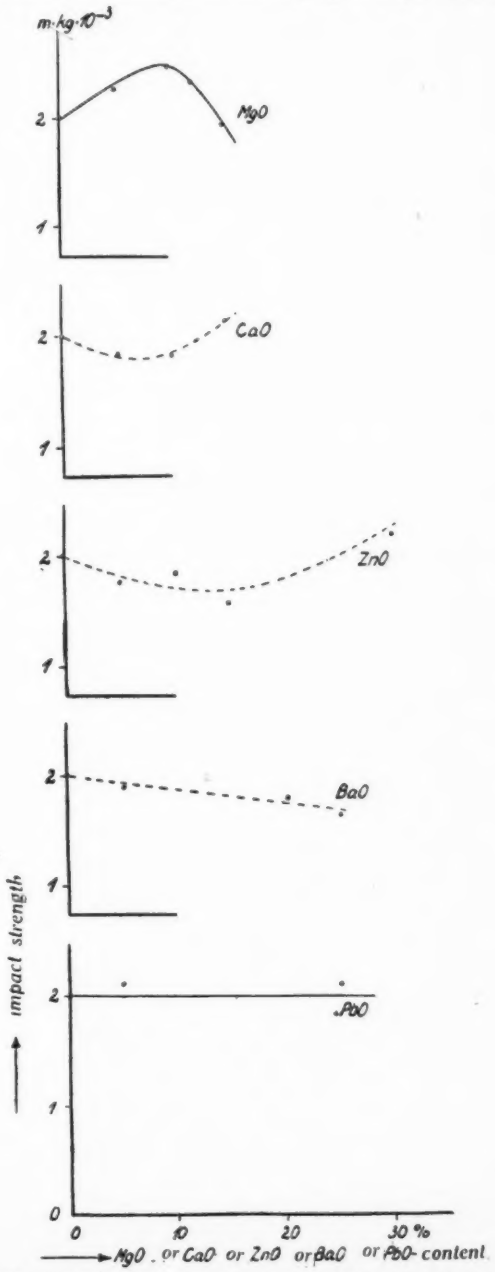


FIG. 30. IMPACT STRENGTH ON REPLACING SiO_2 BY MgO OR CaO OR ZnO OR BaO OR PbO.

* Communication from the Technical Glass Laboratory of the Osram Company, Weisswasser, Germany. Zeitschrift für technische Physik, v. 7, p. 105-260.

then decreases again. Al_2O_3 also seems to increase the impact strength up to a certain percent Al_2O_3. The effect of Fe_2O_3 cannot be recognized; one of the points, the impact strength at 15% Fe_2O_3, resulting from 27 individual measurements which agreed among themselves, was far out of place without obvious cause although in the other mechanical properties the point was in the proper place with the use of the same melt.

In all, these results are not very satisfactory, for which reason we do not give a table of them and we regard the results only as a qualitative statement. Although it must

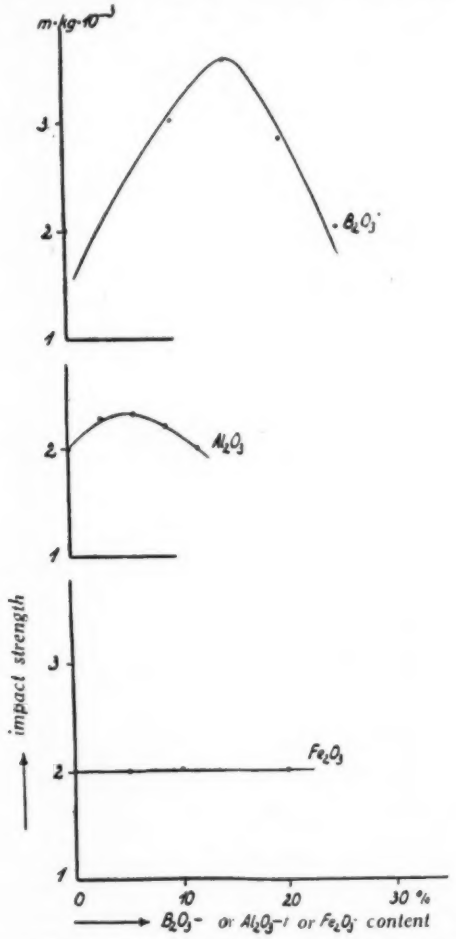


FIG. 31. IMPACT STRENGTH ON REPLACING SiO_2 BY B_2O_3 OR Al_2O_3 OR Fe_2O_3.

be added that on using good and uniform materials this method gives good values, it must be remembered that in practice the defective parts will yield on impact, and the maximum impact strength therefore is only of theoretical interest.

Scratch Hardness

The question of the hardness of glasses was subjected to thorough investigation for the first time by F. Auerbach[20]. The different methods of hardness testing depend on the fact that one permits a substance of determined form to act in any well defined manner on the object to be tested. If the acting substance is of the same material as the substance to be acted upon, one obtains values that depend only on the properties of the object to be tested, while in the other case the properties of the acting object must come into consideration. Starting with this idea, Auerbach determined experimentally the intra-action under pressure between a glass plate and a glass ball of the same material, a problem that was previously discussed theoretically by Hertz[21]. Auerbach confirmed the theory of Hertz. By experimental and theoretical development of the ball pressure test, Auerbach reached an expression that could be determined experimentally, which he regarded as characteristic of the hardness. The values for the hardness of glass determined according to this method however, show no general agreement with the values for the same glasses obtained by a scratching method.

This scratching method consisted in producing strong points on fragments of the glass to be investigated, and in scratching one glass with another under as great pressure as possible. By microscopic investigation he succeeded, even though only by approximation, in arranging his experimental glasses in a single series in relation to their active and their passive scratch hardness.

We did not apply the ball pressure test in our measurements, but we restricted ourselves to the characterization of the glasses as regards their ability to be scratched, and as the scratch hardness is determinative for the grinding process we took up the scratch method. As compared with the Auerbach measurements, we used a considerably improved form due to the developments in measuring technic. We used the Martens diamond hardness indicator as this made it possible to have a diamond act on a glass plate with constant pressure and in the same direction. The glass plate is drawn under the diamond by a carriage. The conically ground diamond with a cone angle of 90° produces scratches on the plate that vary in depth according to the hardness of the glass and therefore vary also in width on account of the conical shape of the diamond. The width of the scratch can be easily measured under the microscope with an occular micrometer. However, as a diamond cannot be ground to an exactly conical shape, an exact measurement can only be made by having the diamond act on the experimental material with varying load, and by determining the load that corresponds to a given scratch width (determined possibly by interpolation). However, this method is extremely troublesome. It is shorter although somewhat less exact if we have the diamond always under constant load and compare the width of the scratches. In this case we consider the hardness as the reciprocal of the width of the scratch, given in 1/mm. On account of the extraordinarily large amount of experimental material, we restricted ourselves to this simple test which, as the results show, gives a very good picture. In all measurements the diamond was under load of 20 kg.; this medium value was selected because with heavier load the scratches frequently showed shell-like cracks, while with smaller load the scratches were narrow

[20] Hovestadt, Janaer Glas, Jena, 1900, p. 174 et seq.—Absolute Härtemessung. Götting. Nachr. Dec. 6, 1890.—Absolute Härtemessung. Ann. d. Phys. u. Chem. v. 43 (1891), p. 61.—Härte, Sprödigkeit und Plastizität. Verhandl. d. Ges. Dtsch. Naturf. u. Arzte 1891—Über Härtemessung, insbesondere an plastischen Körpen. Ann. d. Phys. u. Chem. v. 45 (1892) p. 262—Plastizität und Sprödigkeit, l. c. v. 45 (1892) p. 277.—Uber die Härte und Elastizitätsverhältnisse des Glases, l. c. v. 53 (1894) p. 1000—Die Härteskala in absolutem Masse. l. c. v. 58 (1896) p. 357.

[21] M. Hertz. Über die Berührung fester elastischer Körper. Journ. f. d. reine u. angew. Mathematik, v. 92 (1882) p. 156.

and therefore very hard to measure. With the load selected, the width of scratch was between 0.0039 and 0.0091 mm.

Preliminary experiments showed that, as was to be expected, the fire-polish had a very essential influence on the scratch hardness. Glasses whose scratch hardness is known to be very different from practical experience, showed a slight difference in the scratch hardness on scratching the fire-polished surface; only when the fire-polish was removed were the expected great differences found. Consequently the fire-polish was removed from all the samples by etching. The accuracy of measurement was ± 1.5%. The results obtained with the individual experimental glasses will be explained in the following with the aid of the illustrations.

1. Monvalent glass-formers. The alkalies reduce the scratch hardness very greatly, just as in each case the alka-

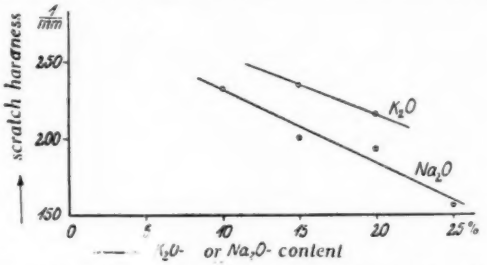


FIG. 32. SCRATCH HARDNESS ON REPLACING SiO_2 BY K_2O OR Na_2O.

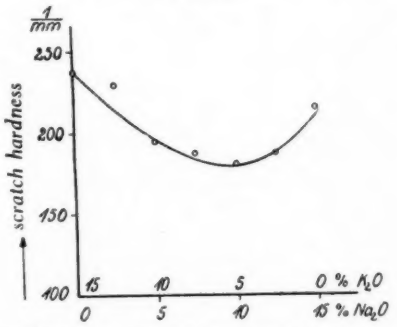


FIG. 33a SCRATCH HARDNESS ON REPLACING K_2O BY Na_2O

lies exert the strongest influence on the physical and chemical properties. Soda glasses are softer than potash glasses (fig. 32). In mixed glasses containing both alkalies, the scratch hardness has a pronounced minimum. Fig. 33 shows this very nicely in a series of glasses in which the potash was replaced by soda. The glasses had the following composition:

SiO_2 .....65%
$K_2O + Na_2O$ 15%
BaO 20%

In this case the minimum is at a composition of 10% soda + 5% potash. It is noteworthy that the minimum is at the same percentage ratio between the two alkalies with which there is also a minimum in the softening temperature (annealing temperature). For purposes of comparison we have shown in fig. 33b the annealing temperatures of the same glasses. There is great analogy between thermal and mechanical hardness. There is no relation between the position of this pronounced ratio between the two alkalies for the scratch hardness, and the position corresponding to the optimum insulating property[22]. Here the alkali ratio of the optimum for the same series of glasses is 12½% K_2O + 2½% Na_2O.

2. Divalent glass-formers. MgO, ZnO and BaO considerably increase the scratch hardness (fig. 34). The fact that BaO also increases the scratch hardness was astonishing because this is contrary to the prevalent opinion as to the effect of BaO on the grinding hardness. PbO reduces the scratch hardness only moderately which is also contrary to general opinion.

3. Trivalent glass-formers. The well-known fact, that by the introduction of only a few percent B_2O_3 glasses be-

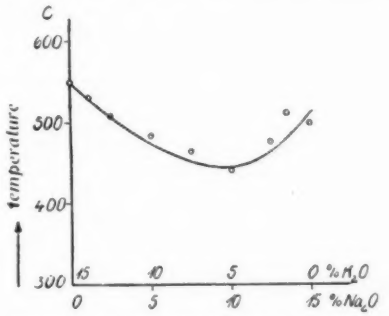


FIG. 33b. ANNEALING TEMPERATURE ON REPLACING K_2O BY Na_2O.

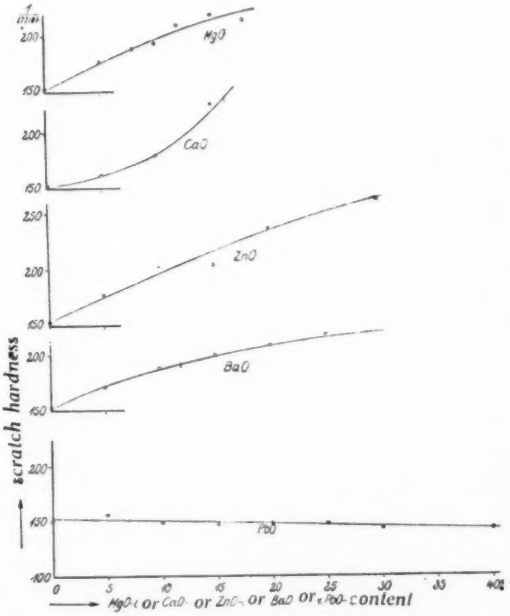


FIG. 34. SCRATCH HARDNESS ON REPLACING SiO_2 BY MgO OR CaO OR ZnO OR BaO OR PbO.

come mechanically very hard, which is noticed plainly on scratching with a file and on subsequent breaking, was confirmed by the scratch hardness test on boric acid glasses (fig. 35). In glasses with increasing boric acid content the hardness increases only to 15% B_2O_3. On increasing the boric acid content further the scratch hardness decreased just as rapidly as it rose. This maximum in the scratch

[22] G. Gehlhoff and M. Thomas. Die physikalischen Eigenschaften der Gläser. 1. Über das elektrische Leitvermögen von Gläsern. Ztschr. f. techn. Physik, v. 6 (1925) p. 544.

hardness at about 15% corresponds to a maximum in most of the physical and mechanical properties at this percentage. Al_2O_3 and Fe_2O_3 slightly increase the scratch hardness.

Table 10 shows the amount by which the scratch hardness, as defined above, changes when one replaces 1% SiO_2 by 1% of another glass-former.

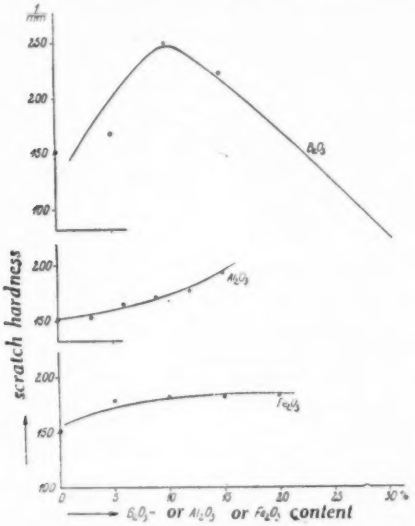


FIG. 35. SCRATCH HARDNESS ON REPLACING SiO_2 BY B_2O_3 OR Al_2O_3 OR Fe_2O_3

Corresponding to the comparatively great accuracy of the scratch method, we have found very good agreement between the calculated values and those determined experimentally for the scratch hardness of a given glass (table 11). The measured value was $182\frac{I}{mm}$.

Modulus of Elasticity

The first systematic investigations of the modulus of elasticity of glasses were made also by Winkelman and Schott[23]. Here also, as with all other properties, they tried to find the relation between composition and modulus of elasticity by calculating coefficients with the assumption of additivity. Consequently this method of representation led to rather great inaccuracies, so that it was necessary to try to calculate coefficients for individual groups of glasses (pure silicate glass, lead-free boro-silicate glass, and finally lead-boric acid and lead-phosphoric acid glasses). If we disregard the oxides CaO and MgO, which were present in only very small amounts and whose coefficients are very uncertain, according to Winkelmann and Schott, the glass-formers have the following sequence:

$$ZnO, B_2O_3, PbO, SiO_2, K_2O, BaO, Na_2O, Al_2O_3.$$

To the best of our knowledge there is only one more recent work on the relation between modulus of elasticity and composition. This is a series of measurements made by Clarke and Turner[24]. This investigation, which referred to a series of soda lime glasses varied by moles, showed that CaO very strongly increases the modulus of elasticity, a fact which was perfectly new as compared with the measurements of Winkelmann and Schott. Further, we find from the measurements of Ludwig[25] that annealed glass has a somewhat greater modulus of elasticity than stressed glass.

As experimental material we used selected rods of circular section and with as uniform as possible diameter over the entire length. The measurement of the modulus of elasticity was made by bending in the usual manner. The rod to be tested rested on two stump knife edges 20 cm. apart. The knife edges had four rectangular cuts in order to give the rod a stable position (see fig. 36). A small mirror S_1 was placed on one end of the rod. This mirror was pivoted on the auxiliary beam T_1 (fig. 36) so it could turn about the point. The auxiliary beam T_2 was provided so that observa-

[23] Loc. cit.
[24] J. R. Clarke and W. E. S. Turner. The influence of lime on the value of Young's modulus of elasticity for the lime-soda glasses. Journ. of the Soc. of Glass Tech. v. 3 (1919) p. 260.
[25] W. Ludwig, Einige elastische Eigenschaften von gekühltem und ungekühltem Jenaer Glas 16 III.

TABLE 10

	0—5%	5—10%	10—15%	15—20%	20—25%	25—30%	30—35%
Na_2O	—	—	—5	—5	—5	—	—
K_2O	—	—	—4	—	—	—	—
MgO	+ 5	+4.6	+3,8	—	—	—	—
CaO	+ 2,4	+3.6	+8,6	—	—	—	—
ZnO	+ 4,6	+4.4	+4,0	+3,8	+3,0		—
BaO	+ 4,2	+3,2	+2,6	+2.0	+1,4	—	—
PbO	— 0,3	—0,3	—0,3	—0,3	—0,3	—0,3	—0.3
B_2O_3	+15	+7	—4.8	—7,6	—9		—
Al_2O_3	+ 2	+2,7	+3,6	—	—	—	—
Fe_2O_3	+ 4,8	+1,0	0	0	—	—	—

TABLE 11

SiO_2	65%	83%	80,2%	74,7%	71,2%	70.7%
Na_2O	14	14	16.8	16.8	16.8	16.8
K_2O	1	1	1	1	1	1
CaO	—	—	—	5,5	5,5	5,5
MgO	—	—	—	—	3.5	3.5
BaO	20	2	2	2	2	2
Al_2O_3	—	—	—	—	—	0.5
Scratch hardness.....	measured 203	—5.2,0 —5.2,6 —5.3,2 —3.4,2	—2,8.5	+5.5.2,4	+3,5.5	+0,5.2 $= 183 \frac{1}{mm}$

tions could be made with two mirrors if desired. This arrangement made it possible to study a large number of samples in a short period of time, as the mirror did not have to be adjusted each time, but always retained its correct position to the telescope. In order to calibrate the apparatus, a small mirror S_2 was cemented on a glass rod, and the rotation of S_2 was observed in the telescope at the same time with that of S_1. The ratio of the two displacements gave

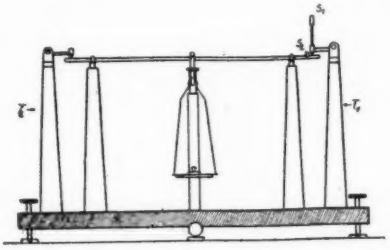


FIG. 36. ARRANGEMENT FOR THE DETERMINATION OF THE MODULUS OF ELASTICITY.

the calibration factor. The reading was made with the Gehlhoff autocollimation reading-telescope, which was placed on the same strong iron plate as the apparatus, in order to prevent bending of the support.

The loading was done by means of a stop arrangement which made it possible to load each rod in the center uniformly and without vibration. The weight of load was 100 g. The accuracy of the measurement depended essentially on the quality of the rod used. With selected material the modulus of elasticity could be determined directly to $\pm$ 1%. Any scattering of the points in the following illustration is therefore not due to the quality of the measurement but to the quality of the rod material. The measurement here also referred to stressed rods with fire-polish. Comparative measurements on stressed, annealed and etched rods of lead glass showed no difference in the value of the modulus of

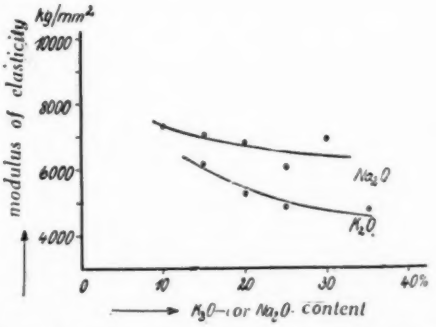


FIG. 37. MODULUS OF ELASTICITY ON REPLACING SiO_2 BY K_2O OR Na_2O.

elasticity outside the limit of error. The apparent contradiction of the measurements of Ludwig is probably explained by the fact that his measurements, compared with ours, were made on very thick rods (10 mm. diameter) and therefore they contained a large number of stresses. Further, measurements on rods of very different diameter (2 to 5 mm.) showed that the modulus of elasticity is absolutely independent of the diameter of the samples.

The results may be stated as follows with the aid of the illustrations.

1. Monovalent glass-formers. Glasses with increasing alkali content show falling moduli of elasticity, and as a matter of fact potash descreases the modulus of elasticity more than soda (fig. 37). The modulus of elasticity of mixed glasses, as is shown in fig. 38, is not the sum of the values for glasses with only one alkali. We see nothing here of pronounced maximum or minimum as is found in any other properties.

2. Divalent glass-formers. As in all the properties, so also with the modulus of elasticity, CaO exerts the strongest influence; the modulus of elasticity increases strongly with the increasing CaO content (fig. 39). Likewise, increasing MgO, ZnO, and BaO, increase the modulus of elasticity

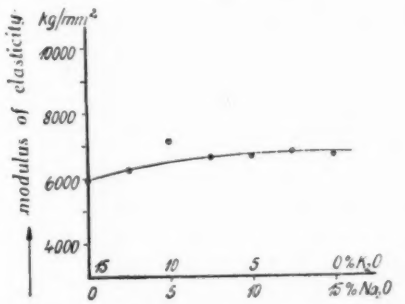


FIG. 38. MODULUS OF ELASTICITY ON REPLACING K_2O BY Na_2O.

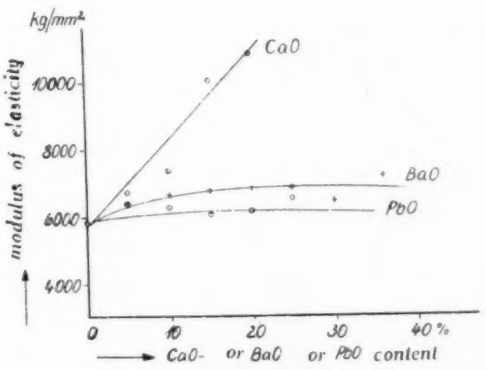


FIG. 39. MODULUS OF ELASTICITY ON REPLACING SiO_2 BY CaO OR BaO OR PbO.

although not to the same extent as CaO (figs. 39 and 40). PbO increases the modulus of elasticity only very slightly.

3. Trivalent glass-formers. As with all the other properties, boric acid glasses at about 15% B_2O_3 show a maximum here. The modulus of elasticity rises abruptly to this percentage and then falls just as rapidly. Fe_2O_3 and Al_2O_3 caused a slight increase in the modulus of elasticity (fig. 41).

The accompanying table shows the amount by which the modulus of elasticity changes when, within a certain percentage range, 1% SiO_2 is replaced by 1% of another glass-former.

With the modulus of elasticity also, there was sufficient agreement between measurement and a calculation similar to those made with the other properties. The measured value was 7310 kg per sq/mm.

TABLE 12

	0—5%	5—10%	10—15%	15—20%	20—25%	25—30%	30—35%
Na_2O	—	—	— 60	— 40	—25	—15	—
K_2O	—	—	—	—130	—80	—35	—10
MgO	+110	+110	+110	+110	—	—	—
CaO	+257	+257	+257	+257	—	—	—
ZnO	+ 65	+ 60	+ 50	+ 25	0	0	—
BaO	+110	+ 50	+ 35	0	0	0	0
PbO	+ 50	+ 20	+ 10	0	0	0	—
B_2O_3	+300	+180	+110	—100	—360		—
Al_2O_3	+120	+ 30	0	—	—		—
Fe_2O_3	+ 48	+ 48	+ 48	+ 48	+ 48		+48

TABLE 13

SiO_2	65%	83%	80,2%	74,7%	71,2%	70,7%
Na_2O	14	14	16,8	16,8	16,8	16,8
K_2O	1	1	1	1	1	1
CaO	—	—	—	5,5	5,5	5,5
MgO	—	—	—	—	3,5	3,5
BaO	20	5	5	5	5	5
Al_2O_3	—	—	—	—	—	0,5
Modulus of elasticity	measured 6700	—5.35 —5.50 —3.110	—2,8.40	+5,5.257	+3,5.110	+0,5.120 = 7660 kg/mm²

Summary

Experiment of glasses with systematically varying composition were investigated for density, tensile strength, transverse strength, compressive strength, shock resistance, scratch hardness and modulus of elasticity, and the influence of the individual glass-forming oxides on these properties was determined. Curves and tables are given from which these effects can be seen numerically. Summarizing the comparative results we may state as follows:

a. Tensile and transverse strength are proportional. There is no proportionality between the tensile and compressive strength as was stated by Winkelmann and Schott. Rather, the glass-formers have exactly the opposite effect on these two properties.

b. The alkalies always exert a very strong effect on the properties. K_2O and Na_2O always act in the same way. A prounounced relation between two alkalies in mixed alkali glasses, as is found with many other properties, was determined here only with the scratch hardness. Perhaps this may be due to the extremely slight maxima for the properties treated here, which generally had very flat curves.

c. Of the divalent glass formers, CaO has by far the strongest influence, BaO and PbO follow at some distance and aways in the same order.

d. The boric acid glasses in all properties with the exception of the compressive strength, show a maximum at about 15% B_2O_3. With the compressive strength a possible maximum could not be recognized due to the almost horizonal course of the curve.

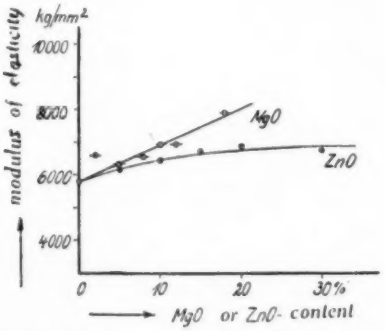


FIG. 40. MODULUS OF ELASTICITY ON REPLACING SiO_2 BY MgO OR ZnO.

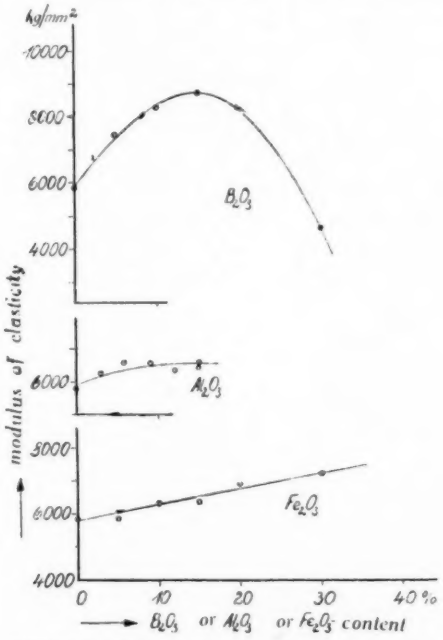


FIG. 41. MODULUS OF ELASTICITY ON REPLACING SiO_2 BY B_2O_3 OR Al_2O_3 OR Fe_2O_3.

(*The End*)

THE ANALYSIS OF FLUORSPAR. By G. E. F. Lundell, chemist, and J. I. Hoffman, associate chemist, Bureau of Standards, Washington. Research paper No. 51, 1929, reprinted from the Bureau of Standards Journal of Research, Volume 2, April, 1929. For sale by the Superintendent of Documents, Washington, D. C.

The Portland Vase
engages public attention

Most Outstanding Example of Glass Craftsmanship and Most Celebrated of Glass Antiquities Offered Unsuccessfully for Sale in England

ECHOES recently reached this country of spirited public discussions in England following the announcement a few weeks ago that the famous Portland or Barberini glass vase, which had been left by his owners for over a hundred years in the safe-keeping of the British Museum, was to be disposed of to the highest bidder at a public sale to be held at Christies' auction house in London.

Art and art collector and antiquarian circles, the general public as well, were deeply stirred by the news. Speculation as to the price that would be obtained and who the adventurous purchaser would be, was prevalent. Estimates running as high as a half-million dollars were published and widespread fear was felt that the historic and magnificent treasure would be carried over to America where money for worthy objects of art was supposed to be easily available to the persuasive.

These fears however proved groundless, for at the sale on May 2 the highest bid of 29,000 guineas (about $145,000) did not meet the reserve price (reported to have been $250,000) and was rejected.

This incident adds another chapter to the history of the Portland Vase. Always, since its existence became generally known to the world it has been regarded as one of the most valued of ancient works of art. It's origin always has been and still is a mystery. Where it came from, the sculptor's identity, and what the white opaque glass carvings on it's onyx-colored exterior surface were intended by it's creator to represent, has been much thought and written about and every once in awhile the discussion breaks out anew.

It had been for a long period almost universally believed that the vase was discovered about the sixteenth century full of ashes in a marble sarcophagus found under a mountain, del Grano, a short distance out of Rome. From carved reliefs on the sarcophagus depicting a story of Achilles, and from other evidence it has been deduced that the tomb was built about A.D. 200. But later investigators, according to Christies' catalog, learned that while the buried and hidden sarcophagus was undoubtedly discovered approximately at that time, no record of the finding of the vase in it was made by a contemporary writer who recorded the discovery. This of course casts doubt on the long-cherished story. The first known mention of the vase in writing, according to Josiah Wedgwood, was made in 1642 by Count Tezi, who wrote that the vase was of violet color and "so transparent you would think it a native amethyst."

However, it is recorded that the excavations were in charge of Matteo Barberini who rose to be Pope Urban VIII, and that the vase when discovered was first deposited by him in the Barberini Palace at Rome where it remained about a century until bought by Sir William Hamilton who is reputed to have disposed of it secretly to the English Duchess of Portland. Later it came into the possession of the Duke of Portland who purchased it for a sum equal to approximately five thousand dollars in American money. In 1810 a member of the Portland family placed the vase in the British Museum in London where it has remained ever since.

In 1845 a demented or drunken visitor to the Museum smashed the vase to fragments with a stone. Most of the pieces were saved however and a skillful artist with cement restored the vase to a good resemblance of its original condition, although some of the parts are still missing and many of the cracks remain decidedly noticeable, as may be observed in the accompanying illustration. The repaired vase is still treasured and kept for safety in the Gold Ornament Room of the British Museum.

All Roman blue medieval glasses such as the Portland vase are known as red-blue and were colored by cobalt oxide. The cameo cuttings of the Portland Vase is the feature that makes for its attractiveness. The ingenious sculptor varied the shades of color in the carvings by cutting the white glass thinner in some places than others, which produced semi-transparency, making the colored glass underneath the white visible to some degree. In the descriptive catalog issued in connection with the recent sale in London it is told that the vase is in the form of an amphora about ten inches high. The material is glass of an intensely deep blue, which is decorated with figures in relief composed of glass of an opaque white.

The handles of the vase, which are twisted in cable form, terminate in masks of Pan, his horns encircling the base of each handle; they divide the figures around the body of the vase into two groups, each relating to the story of Peleus and Thetis.

On one side of the vase, according to this account, (see small illustration) is Peleus wooing Thetis: Thetis is seated

on a low seat of rock with hair falling in curls, and drapery over her legs, placing her left hand in an affectionate manner on the back of a sea-monster (in the form of a dog-headed serpent) at her side. She stretches out her hand towards Peleus, who approaches somewhat timidly from the left, placing his left hand on her arm, and holding a piece of drapery in his right. Eros flies before him with torch in right hand and bow in left, leading him on. Poseidon stands on the right in characteristic pose, with right foot raised on a rock, and right arm resting on thigh, the hand supporting his chin, watching the scene; around his left arm is drapery. In the background are a fig tree, an olive tree, and a portion of a Doric building, with two columns supporting an entablature.

On the opposite side of the vase (see large illustration) Thetis is shown reclining on a pile of rocks, in the conventional attitude of sleep, with right hand on her head, and left arm resting on the rocks, draped only about her lower limbs. She holds a torch inverted in her left hand; in the background is a fig tree, and at her feet an overturned altar (?). On the right is another woman (Aphrodite?) seated on a pile of rocks, draped about the legs, with a sceptre in her left hand. On the left is a man (Peleus?), nearly nude, seated on rocks; he is watching the sleeping Thetis, and is himself watched by the woman on the right. Beyond him is a column.

On the bottom of the vase is a youthful bust, wearing a Phrygian cap, thick-sleeved jerkin, and chlamys fastened with stud at throat, apparently intended for Paris. In the field is a fig tree.

The subjects were for a long time considered to be of doubtful interpretation, but it seems indisputable that the first scene represents a lover courting a being connected with the sea, and no legend is known to which the scene is more appropriate than that of Peleus and Thetis. The main difficulty in this interpretation is that according to the usual scheme Peleus is represented wrestling violently with Thetis, and attacked at the same time by the animals into which she transformed herself. In the present instance a more peaceful version of the legend seems to be represented, and the sea-monster may be a reminiscence or suggestion of the conventional scheme. Such a form of the legend is not inconsistent with the words of Catullus, and is distinctly implied in the account of Philostratus. It may also be pointed out that the variation is wholly consistent with the tendency of later art to tone down the conventional schemes of earlier art, such as that of the black-figured and earlier red-figured vases, with a view to picturesque grouping of figures and effective composition avoiding violent action. The transition is well seen in the fourth-century vase from Rhodes with this subject, as compared on the one hand with Peithinos kylix in Berlin, and on the other with the present version.

With reference to the second group, if it is regarded as independent of the other no satisfactory explanation of the subject has yet been offered. But if the same figures are repeated on each side, as seems probable, the scene represented must be some unrecorded incident in the courtship of Peleus and Thetis. If this interpretation is correct, it seems best to suppose that the group represents a later incident than the other, and that Peleus is watching his sleeping bride in the presence of Aphrodite (who forms a pendant to the Poseidon of the other group). The pose of the latter is suggestive of a local personification, but such characters are usually made more subordinate to the main personages.

As regards the technical methods employed (according to the announcement referred to above) the vase of blue glass was first made, and was then covered with a layer of white glass. The handles of blue glass were then added, the base of each handle resting on the layer of white. The next process was to carve the white layer in the manner of a cameo. In the spaces between the reliefs the whole of the white layer and a part also of the blue layer were removed. Thus, in certain places, as for example above the Eros, portions of the design are seen in relief in blue.

These carved works in glass, of which few specimens survive, were known to the ancients as toreumata vitri. A similar, but inferior example, is the vase found at Pompeii.

It is probable that the Portland vase must be assigned to the first century of the Roman Empire, or to the close of the Republic. The manufacture of glass vases and the cutting of cameos was hardly practised at Rome before this time. On the other hand the specimens from Pompeii prove that this technique had reached its full development before

A.D. 69. The style of the work shows that the Portland Vase belongs to an earlier date than the tomb in which it is reputed to have been found, but as the connection is extremely uncertain, no argument can be based on this alone.

Mr. Walter Butterworth, former President of the Society of Glass Technology and at the head of a large glass manufacturing company, in a communication to the *Manchester Herald*, quoted in the *Pottery Gazette and Glass Trade Review* said:

> "Of all Roman glasses the most justly celebrated are the carved cameo cups and vases, of which the Portland or Barberini Vase stands as the supreme type. They were made in layers of differently coloured glass imitating natural stones, such as onyx, usually opaque white upon a blue ground, though the layers have been of as many as five different colours. This treatment of glass was adopted from lapidaries who carved their designs through the coloured strata of stones.
>
> "The cameo carving of the Portland Vase is wonderfully skillful and elaborate. No finer cutting is to be seen in the whole history of glass manufacturing decoration. The vase is ten inches high, six inches wide, and is perhaps a little lacking in grace of form. The body of glass is dark blue, and over this was 'gathered' an outer casing of opaque white glass. Through this the craftsman sculptured his figures and landscape in a style reminiscent of the cameos of the Hellenistic Greeks. With notable patience and feeling for his hard but fragile material, he carved through the white layer, leaving his exquisite figures in varying relief and penetrating to the blue background, thus producing the perspective, shade, and distance required. The figures, deliciously grouped and finished with an almost incredible delicacy, happily embody classic legends, probably including the story of Peleus and Thetis, but classical authorities cannot agree about this. The vase has a separate bottom piece, also beautiful, but inferior, with the figure of a youth wearing a Phrygian cap. It was carved by another artist with considerable skill.
>
> "The time when this work was wrought was probably not later than 150 B. C."

There are numerous fragments of this onyx style of carved glass, but only two other vases in existence. Two amphoræ which may be compared with the Portland Vase were both found in the ruins of Pompeii.

Several copies of the Portland Vase have been made in both glass and pottery. Wedgwood, the famous potter, who had the original glass vase in his possession for a year, made one in pottery that brought him great praise and profit.

NOTE—Two books relating to the Portland Vase were published in London in 1845. One, by W. Pickering, is entitled "A New Elucidation of the Subjects on the celebrated Portland Vase, Formerly Called the Barberini; and the Sarcophagus in which it was Discovered, by Thomas Windus, F.S.A." The other is a reprint of "a description of the Portland Vase, formerly the Barberini; the manner of its formation, and the various opinions hitherto advanced on the subjects of the bas-reliefs. By Josiah Wedgwood, F.R.S., F.R.A. With the addition of notes by Thomas Windus, F.S.A."

The New Import Duties on Glass

Since the report below was written the House of Representatives on May 28 passed the tariff bill and sent it to the Senate. Several changes in the glass duties recommended by the Ways and Means Committee were adopted, including table and kitchen glassware raised from 55% to 60% ad valorem. Plate glass not exceeding 384 sq. in. remains at the present rate, 12½ cents. Sodium sulphate and salt cake are made dutiable at $4 a ton.

The proclamation dated May 14, 1929, issued by President Hoover under the so-called flexible provisions of the tariff act of 1922 increases the customs duties on cylinder, crown, and sheet glass, known as window glass, ranging from ⅝ cents per pound to 1½ cents per pound, according to the size of sheets. The increases determined and proclaimed by the President are as follows:

"Increases in said duties on cylinder, crown, and sheet glass, by whatever process made, and for whatever purpose used, unpolished (within the limit of total increases provided for in said act), not exceeding 150 square inches, from 1¼ cents per pound to 1⅞ cents per pound; above that, and not exceeding 384 square inches, from 1⅜ cents per pound to 2⅛ cents per pound; above that, and not exceeding 720 square inches, from 1⅝ cents per pound to 2⅞ cents per pound; above that, and not exceeding 864 square inches, from 1¾ cents per pound to 2⅝ cents per pound; above that, and not exceeding 1,200 square inches, from 2 cents per pound to 3 cents per pound; above that, and not exceeding 2,400 square inches, from 2¼ cents per pound to 3⅜ cents per pound; above that, from 2½ cents per pound to 3¾ cents per pound:

"Provided, That unpolished cylinder, crown, and sheet glass, imported in boxes, shall contain 50 square feet, as nearly as sizes will permit, and the duty shall be computed thereon according to the actual weight of glass."

The proclamation was issued as of May 14, 1929, and the new custom rates take effect thirty days later.

Meantime the House of Representatives was presented with a tariff revision bill by the Republican members of the Ways and Means Committee who had been working on the bill for several months. This bill proposed the following duties on the importation of glass of various types as follows:

Laminated Glass, Composed of Layers of Glass and Other Materials—New, 60 per cent ad valorem.

Rolled Glass, Not Sheet Glass, whether or not fluted, figured or rough, or containing a wire netting, divided into classes with duty per square foot as follows—Present, ¾ or 1 cent, new, 1 cent; present, 1½ cents, new, 2 cents. Same where weighing over 100 pounds per 100 square feet, shall pay additional duty on excess at same rates.

Plate Glass, by whatever process made, not exceeding 384 square inches—Present, 12½ cents per square foot, new, 16 cents. From that to 720 square inches—Present, 15 cents, new 19 cents. All above that—Present, 17½ cents, new 22 cents; but none of the above glass more than one-half inch thick shall pay less duty than 50 per cent ad valorem.

Plate Glass Containing a Wire Netting, not exceeding 384 square inches—Present 15 cents per square foot, new 17 cents. From that to 720 square inches—Present 17½ cents, new, 20 cents. Above that—Present 20 cents, new 23 cents.

(The bill describes plate glass as "glass wholly ground and polished on both surfaces.")

Plate, Cylinder, Crown and Sheet Glass, when made into finished or Glass and Glass Mirrors exceeding 144 square inches—Present 13½ cents per square foot, new 17 cents. Above 384 square inches—Present, 16 cents, new 20 cents. Exceeding 720 square inches—Present 21 cents, new 23 cents. Provided none of the above shall pay less than 45 per cent ad valorem, an increase from present 35 per cent.

Plate, Cylinder, Crown and Sheet Glass and Glass Mirrors Exceeding 144 square inches remain at 5 per cent ad valorem in addition to the rates otherwise chargeable, but the paragraph describing such glass contains new descriptive terms.

Optical Glass for Spectacles or Instruments—Present, 45 per cent ad valorem; new, 50 per cent.

Incandescent Electric Light Bulbs With Filaments—Present, 20 per cent ad valorem; new, 30 per cent.

Stained or Painted Glass Windows Not Specially Provided For—New, 60 per cent ad valorem.

Glass and Its Manufactures, ruled for photographic reproduction or engraving—New, 55 per cent ad valorem.

Active opposition to the adoption of these rates has developed and nearly 100 changes in the complete list have been proposed, including a reduction from the glass rates named in the Ways and Means Committee bill. The changes include the suggestion that the duty on plate glass not exceeding 384 inches square be reduced from 16 cents to 12½ cents per square foot. Further changes are probable before the bill is enacted into a law.

Bottles, Vials and Jars, Wholly or Chiefly of Glass, or Character designed for Perfume, Talcum Powder, Toilet Water or Other Toilet Preparations—Present 55 per cent ad valorem; new 65 per cent.

Table and Kitchen Utensils, Chiefly of Glass Not Specially Provided For, Where Colored, Cut, Etched, &c., Where Unfilled or Filled with Dutiable or Non-Dutiable Articles—Present, 55 per cent ad valorem, new 60 per cent.

Cylinder, Crown and Sheet Glass of various descriptions is subjected to these changes from the present tariff law: from 1¼ to 1⅞ cents per pound, from 1⅜ to 2 1-16 cents, from 1⅝ to 2 7-16 cents, from 1¾ to 2⅝ cents; from 2 to 3 cents, from 2¼ to 3⅜ cents; from 2½ to 3¾ cents, provided that none of the above shall be subjected to a less rate than 50 per cent ad valorem.

Glass Industry

ESTABLISHED 1920

The First Trade Journal Devoted Primarily to Glass Technology, Engineering, Raw Materials and Glass Factory Equipment and Operation

Published Monthly

Copyrighted, 1928, by

GLASS INDUSTRY PUBLISHING COMPANY, INC.
50 Church Street, New York

Telephones { Cortlandt 2465 / Cortlandt 2466 — Cable Address, Glasdustry

J. B. KRAK, Technical Editor

Subscription Price .....$2.00 a Year
Single Copy .....20 Cents

THE GLASS INDUSTRY circulates extensively among American and foreign glass manufacturers, their business executives and technical and factory operating staffs.

Vol. 10 JUNE, 1929 No. 6

CONTENTS

	Page
The Progress of Glassmaking in the States..... By Professor W. E. S. Turner	131
Pressing Glass	135
Glass Container Association New Research Laboratories.....	136
The Selection of Coal for Gas Producers	138
The Physical Properties of the Glasses and Their Relation to the Composition	139
The Portland Vase Engages Public Attention	145
Editorial:	
Business Ethics	148
Glass Container Association Meets at Atlantic City.....	149
Recent Patents	150
Three Busy Weeks Spent Here by Visiting British Ceramists	151
The Glass World and What It Is Doing:	
Propose Change in American Window Glass Stock.....	152
New Plunger on the Market	152
No Import Duty on Sodium Selenite	152
Expansion of Triplex Safety Glass Company	153
Vitaglass Corporation Report	153
Glass Sand Freight Rates Cut.....	153
Tyre Bros. Producing Laminated Glass	153
April Construction Figures Highest on Record	154
Will Make Laminated Glass in England	154
Trade Activities	154
Coming Meetings	155
Inquiries Received	155
What the World Wants	155
Glass Stock Quotations	155
Current Prices of Glassmaking Materials	156
Monthly Summary of U. S. Commerce in Glass	156

INDEX TO BUYERS' GUIDE, PAGE 20
INDEX TO ADVERTISEMENTS, PAGE 22

Business Ethics

The subject of business ethics is being discussed at great length in luncheon clubs, in advertising matter and in the press, and is being fostered by Better Business Bureaus organized in every large city of the country. The Federal Trade Commission is also very active in this work. Yet willful violations of ethics in business are by no means uncommon.

The glass industry is no exception. However, most violations may be considered as ethical breaches of omission rather than those of commission. This is undoubtedly due to the fact that unscrupulous advertisers take advantage of the lack of knowledge of the public with regard to glass technology.

This will not always be so. Through the technical press and such organizations as the American Ceramic Society which aid in diffusing knowledge about glass and its manufacture, the general public is learning what glass is, and what is considered good quality. The buying public is learning to distinguish between high grade glassware and cheap imitations. It is obvious therefore that any violations of ethics will in the long run react to the detriment of the glass industry as a whole.

Many opportunities for "fooling the public" occur in the line of decorated glass. The methods of application of materials used for decorating glass, the questions of quality and style are quite foreign to American consumers of glassware. Serious violations may be noticed from time to time. One which has only recently come to our attention was by a firm which by name and reputation has been associated for many years with decoration involving the deposition of metallic silver of glass by an electrolytic method. This firm now resorts to the less costly and entirely different method of applying silver metal through the medium of heat only. The ware is advertised and sold as silver decorated glassware, which is undoubtedly true. However, the fact that this decoration is not made by electroplating and consequently does not involve the same depth of metal as the former process is not made known. It is also not divulged that the decoration offered at a lower price is not as permanent as the higher quality and more expensive decoration. The disappointment of the purchaser when this fact is discovered is obvious.

Again the name Roman Gold, or Burnish Gold decoration implies that the design is gilded with a paste gold known as Roman Gold, and which involves only powdered and precipitated metallic gold, mixed with suitable mediums and oils. Some decorators have resorted to the use of liquid bright gold as a dilutant. The result is that the decoration in time becomes discolored and that it cannot withstand the usual cleansing treatment given to glass tableware. Faith in the Roman Gold decoration is thus shaken with the result that the public no longer looks upon Roman Gold decoration with favor. Numerous other violations of a similar nature might be mentioned.

Such practices, while not reprehensible in themselves, become serious violations of business ethics if the nature of the decoration is misrepresented, and the whole truth is not told. While they may result in a profit to some, their result on the whole decorated glass industry is deplorable, and is

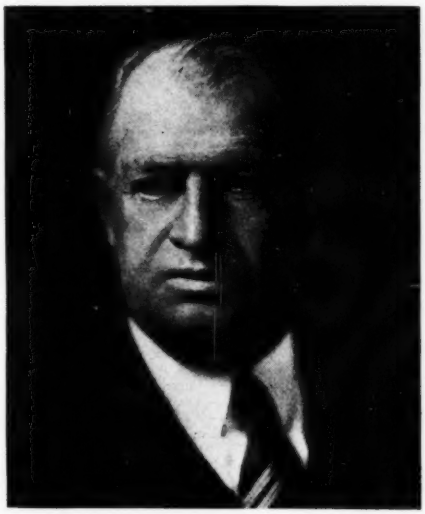
a reflection on everyone connected with the industry. That a whole industry may suffer from such practices has been proven in other instances. If we are intent upon building up an American decorated glass industry, with a reputation such as other industries have gained, such violations must cease, and the sooner the better. The axiom: "the truth, the whole truth and nothing but the truth" should prevail if the industry's best interests are to be safeguarded.

Glass Container Association Meets at Atlantic City

Great Progress Reported at Annual Meeting Held at Hotel Traymore

One of the largest and most enthusiastic meetings of the Glass Container Association was held on May 1, 2 and 3 in Hotel Traymore, Atlantic City. The reports of the various officers and of the heads of the departments showed much progress made during the past year. The aim of the Association's work, Co-operation was admirably discussed by J. Thomas Lyon, a Baltimore financier, whose inspiring address was one of the high lights of the meeting.

After sessions of the Board of Directors and the Publicity Committee on Tuesday, April 30, the first general meeting was held on May 1, beginning with the opening address of the President, Philip I. Heuisler, followed by a report of the year's activities by Business Manager Charles R. Stevenson and a statistical digest by



PHILIP I. HEUISLER
President
The Glass Container Association

E. G. Ackerman, Director of Statistics. In the afternoon a number of members attended the golf tournament held at the Seaview Golf Club at Absecon. Horseshoe pitching and bridge was enjoyed by non-golfers.

The meeting on May 2 opened with a discussion of the Associations' slogan: "See What You Buy—Buy in Glass," by I. R. Stewart, Chairman Publicity Committee; F. L. McCabe, United States Advertising Agency, and John S. Barlow, Advertising Manager. This was followed by a number of short addresses having for their general title: "Increasing the Use of Glass Containers," by Fred J. Rummel, Assistant Business Manager; W. L. Davis, New and Increased Use Department; J. T. Hendricks, Director of Public Relations; J. C. Magness, Director of Traffic Department; S. H. Ayers, Director of Research; K. L. Ford, Chemical Engineer; H. A. Barnbey, Chemist; N. E. White, Editor, *The Glass Container*, and P. C. Doyle, Chairman, Standardization Committee.

The sessions on May 3 were devoted mainly to committee reports and nomination of officers. Reports were read of the Committees on Standardization by P. C. Doyle; Tariff, by H. O. Brawner; New and Increased Use, by H. D. Hartley; Legislation, by E. F. Glacken; Membership, by J. H. Graham.

The principal address was by Nelson B. Gaskill, former chairman of the Federal Trade Commission, entitled, "Price Control."

The retiring officers were re-elected. They are: Philip I. Heuisler, Maryland Glass Corporation, Baltimore, President; Walter H. McClure, Hazel-Atlas Glass Co., Wheeling, and H. C. Mandeville, Thatcher Manufacturing Co., Elmira, Vice-presidents; and R. E. Walker, Turner Glass Co., Terre Haute, Secretary and Treasurer.

A banquet and entertainment on Friday evening brought the meetings to a close.

THE PRESIDENT'S ADDRESS

The motto of my native State, Maryland, is "Fatti Maschii Parole Femine." Literally translated it means—"Manly in deeds—Womanly in words," or very freely it may be thus expressed—"Actions speak louder than words." Therefore since there are many on the program who will tell you of the good work actually done and experiences gained of greatest value to our industry, I shall, in making my Annual Report, speak in general terms only, giving to our business manager, his staff, department heads and committee chairmen an opportunity of laying before you the details of the specific work with which they are entrusted.

First of all, I would say that the past year, from an Association standpoint, has been a successful one.

The newly appointed Statistical and Cost Committee has met frequently and inaugurated some very constructive policies. Mr. Stevenson has brought to us a wide experience and mind trained in the proper conduct of association activities, the executive staff has been augmented and reorganized to secure best possible results. New committees have been formed. Of these, the New Use Committee, dealing with extension of the use of glass containers, and the Public Relations Committee, whose work is to establish parity in freight rates between glass and tin, are functioning to a high degree.

The Standardization Committee, with Mr. Doyle as Chairman, has carried on the work of standardization of glass finishes, and has, in co-operation with the Department of Commerce and users of bottles, inaugurated a movement for simplification of containers themselves.

I have referred particularly to these committees because of the new activities they have taken up. There are others whose work is of just as much importance, and their reports will be presented at the various sessions. Of these, the Publicity Committee has the greatest appeal, because through it we are inaugurating a nation-wide advertising campaign in well-known periodicals.

The chairmen of your committees have been carefully selected, the committees themselves represent a true cross-section of the industry, and they deserve your united support. Their efforts have been untiring and intelligently directed, and the results, as indicated by the reports you will hear, will, I know, be satisfactory to you all.

Many changes have occurred during the past year, notably a merger of two of our largest companies. Under the wise leadership of those who have conducted their affairs in the past, I feel sure that this amalgamation will bring nothing but benefit to the industry.

The future lies in your hands. Every action, every decision, the whole conduct of your business during the coming year must be carefully analyzed as to its effect on your industry as a whole. A prosperous industry spells prosperity for you. An industry poorly conducted brings us all face to face with adversity.

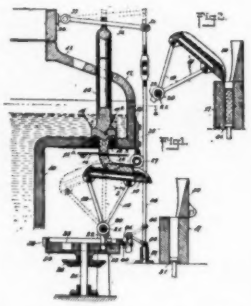
In conclusion, permit me to thank you for the loyal support you have at all times given your officers, directors, executive staff, department heads and committee chairmen, and let us ask that you will give to the incoming administration that same degree of co-operation which has enabled us to carry on so successfully during the past year.

Recent Patents

NEW INVENTIONS DESIGNED TO IMPROVE GLASS AND THE MEANS OF PRODUCING IT

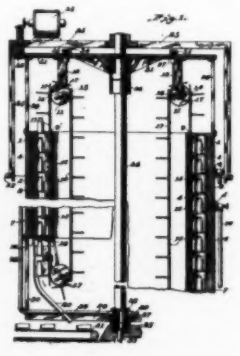
Complete copies of U. S. Patent Specifications may be obtained from the Commissioner of Patents, Washington, D. C. Price 10c each

GLASS-SERVING APPARATUS. U. S. 1,712,327. May 7, 1929. Homer Brooke, Mount Vernon, N. Y. Filed 1/25/27. In accordance with the usual method of flowing and serving slugs of molten glass from the furnace, the colder end of the slug is received in the neck forming mold, consequently considerably slowing up the molding operation and rendering the machines less efficient in use. The present apparatus enters the slug into the original container in such a manner that the hotter end of the slug may be subsequently used when molding the neck of a bottle. The inventor's claims include apparatus for serving glass including a vertically reciprocatory plunger for closing the discharge orifice, a tilting dumping trough arranged under the orifice on to which slugs of glass flowed through the orifice are delivered, means for severing a slug after each descent of the plunger to close the orifice, and means for moving the dumping trough to slug-discharging position after each operation of the knives, the trough being arranged close to the discharge orifice and moving at a rate of speed which causes the major portion of the slug to be laid down thereon as the slug is discharging, and means for laying down the hot tail end of the slug on the dumping trough before the slug is dumped, comprising a member arranged in the path of the slug to mechanically smooth down the hot tail end of the slug as the trough is moved.

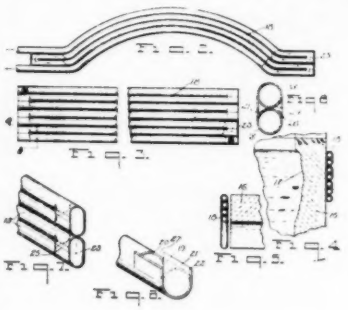


PROCESS OF MAKING BERYLLIUM OXIDE. U. S. 1,710,840. April 30, 1929. Robert C. Price and Hugh S. Cooper, Cleveland, O., assignors to Beryllium Corporation of America. Filed 12/13/23. Process of decomposing beryllium minerals which comprises heating the mineral with a flux including a calcium compound, adding sulphuric acid to the product so obtained, and dehydrating, dissolving the sulphate produced in water, evaporating to a density of about 1.31, and separating the precipitated calcium sulphate. A glass containing beryllium has been developed at the Department of Chemistry, University of Pittsburgh.

ROTARY VERTICAL LEHR. U. S. 1,712,205. May 7, 1929. Robert Good of Washington, Pa., assignor to Hazel-Atlas Glass Co. Filed 4/28/24. A rotary lehr for annealing glassware, an oven extending vertically there through. Means for rotating the lehr and means for carrying glassware downwardly through the oven. A number of such vertical lehrs may be arranged in circular series and the series as a whole given a rotary motion while the articles are slowly carried step by step from top to bottom of the lehrs. Fig. 1 indicates a muffle. 3 is a burner passage in which is arranged a tube provided with a plurality of jet holes. Below the muffle is a tubular member of heat-absorbing material such as ordinary fire clay. This becomes saturated with heat, furnishing substantially a fireless extension of the muffle, but non-heat-absorbing material may be substituted therefor. Each lehr is enclosed in a casing of insulating material, in the casing of which is a passage extending from top to bottom within which is operated an endless chain carrying shelves on which the glass articles are placed. The bottoms of each tubular oven and each passage are provided with tiltable closure members. The belt conveyor moves the article one step at a time through the lehr, the sprocket being rotated by the weight of the article on the downward run of the conveyor. Gas may be supplied to burners in any desired manner. Heat that is radiated from lower articles on the conveyor functions as a baffle to prevent the rapid radiation of heat from the upper article. Very little, if any, heat other than the residual heat of the articles is necessary.

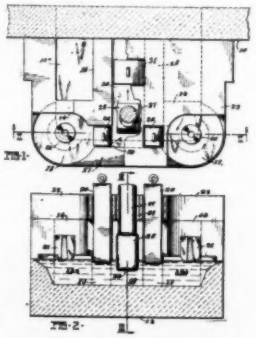


SHEET-GLASS COOLER. U. S. 1,707,242. Apr. 2, 1929. Jesse W. Wildermuth, Lancaster, O., assignor to The Libbey-Owens Sheet Glass Co. Filed 10/13/24. An object is to provide a cooler having a tortuous passage for a cooling medium whereby the cooler can be associated with the tank wall and the tongue arch of sheet glass drawing apparatus in a manner to prevent deterioration of these members due to the terrific heat to which they are exposed.

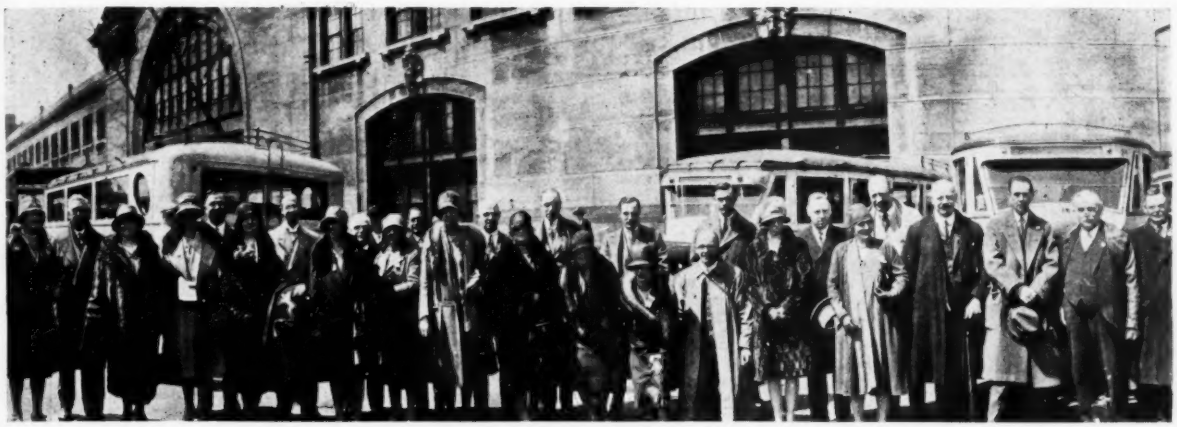


The inventor claims a cooler for use in glass apparatus, comprising a plurality of separate cylindrical members arranged in parallel relationship, each member contacting with the adjacent members, one end of each member and the same end of one adjacent member being split longitudinally and cut transversely at the inner end of the spit to provide a pair of lips, the lips of said adjacent members being directed towards and secured to one another, a single closure secured to the outer ends of said lips, and means for closing the spaces between the inner ends of said lips and said members.

GLASS APPARATUS. U. S. 1,710,789. April 30, 1929. L. D. Soubier, Toledo, O., assignor to Owens Bottle Company. Filed 6/10/26. A glass feeder comprising in combination a refining tank, a forward extension on the tank having a channel formed with inlets for glass at its opposite ends communicating with the interior of said tank, means permitting transfer of charges of glass from the channel to a forming mold, and a passageway between the inlets interconnecting the channel and said tank and permitting return of ungathered glass from the channel to the refining tank. Fig. 1 is a plan view, partly in section, and illustrates the extension arrangement where a plurality of charges are simultaneously gathered and transferred to a stationary forming machine. Fig. 2 is a sectional view taken substantially on the line II—II of Fig 1.



LENS-EDGE-GRINDING MACHINE. U. S. 1,713,622. May 21, 1929. Howard Rakel, Cincinnati, O. Filed 8/11/26. In a lens edge grinding machine, the combination with the grinding tool, of a rotary lens holder, means for presenting the axis of rotation of said lens holder successively at reverse angles to the grinding face of said grinding tool, said means comprising a cam including an interruption and a coacting part coacting with said cam, and means for locating said coacting part in said interruption whereby to maintain said axis of said lens holder substantially parallel with said grinding face of the grinding tool.



Three Busy Weeks Spent Here By Visiting British Ceramists

THE tour of a number of members of the Ceramic Society of England who arrived at New York April 29 ended on May 18 when the party sailed from New York for their homes in England. On the evening of April 29 the visitors were entertained at a Ceramic "Welcome" dinner at their headquarters, the Pennsylvania Hotel. Among those present at the dinner were the following: Wm. S. Gardner, President of the English Ceramic Society, Dr. J. W. Mellor, Professor W. E. S. Turner of the Department of Glass Technology, Sheffield University and Honorary Secretary of the Society of Glass Technology, Professor G. A. Bole, President of the American Ceramic Society, Ross C. Purdy, Secretary of the Ceramic Society, Dr. Edward Orton, Sir William Jones, Mr. Eskesen, Senator Ford, Mr. Job Holland, Mr. Wood, Doulton, England, MacDonald Booze, J. B. Krak, Professor Brown of Rutgers University, and Harry Lee King, who acted as toastmaster. Other glassmen present were Professor Silverman of the University of Pittsburgh and Frederick Carder of the Steuben Division of the Corning Glass Works, Dr. J. T. Lyttleton, head of the Triplex Safety Glass Company, England, Carl G. Hilgenberg of the Carr-Lowrey Glass Company.

WILLIAM J. GARDNER
President of the English Ceramic Society
Wearing the Recently Adopted Badge of Office

Mr. Gardner is Past-President of the Refractories Association of Great Britain. Past-Vice-President of the Society of Glass Technology, Member of the Glass Research Delegacy of England.

During their stay in this country the ceramists travelled over an immense amount of territory, visited many ceramic plants of different kinds where they were shown the latest American developments in manufacturing processes. They were also shown several glass plants. At many points visited they were entertained at dinners and luncheons and in other agreeable ways by the American Ceramic Society and committees representing various ceramic centers.

The party had been split into two sections, one including the whitewares and building materials groups and the other group taking in those interested in refractories.

For most and perhaps all the visitors the trip proved most interesting and much valuable knowledge of ceramic conditions and activities in this country was obtained by these friends from overseas.

TWO PICTURES SHOW THE CERAMISTS LINED UP AT THE DOCKS IN NEW YORK WITH THE AMERICAN CERAMIC SOCIETY'S RECEPTION COMMITTEE

The Glass World and What It Is Doing

News of the Industry

Propose Change in American Window Glass Stock

The American Window Glass Company has published a notice of a special meeting of stockholders to be held at the company's office, Farmers Bank Building, Pittsburgh, July 30, 1929. The purpose of the meeting is to vote for or against the conversion of the 130,000 par value $100 shares of common capital stock now issued and outstanding, into two classes. The notice sets forth the plans for converting 70,000 shares of common stock into 70,000 shares of class A stock par value $100, which will be entitled when declared from surplus or net earnings to cumulative dividends at the rate of 7% per annum from October 1, 1927, and preferred as to dividends and assets and subject to conditions imposed by the board of directors at its annual meeting, May 21, 1929. The remaining 60,000 shares of present common stock to be converted into 130,000 shares of common stock without nominal or par value, both classes of stock to be subordinated to the rights, privileges, priorities, preferences and voting power as respects the creation of mortgage liens and other terms and conditions of the 40,000 shares of present outstanding preferred capital stock. The stated capital of the company is to be $17,000,000 of which (a) $4,000,000 shall be applicable to the 40,000 shares of preferred stock now issued, outstanding and unconverted; (b) $7,000,000 shall be applicable to the 70,000 shares of Class A stock proposed to be issued in the place of 70,000 shares of the common stock now issued and outstanding and (c), the remaining $6,000,000 to be applicable to the proposed 130,000 shares of new common stock without nominal or par value.

New Plunger on Market

A new plunger for use in glass feeders has been put on the market by a new organization, the Miller Foundry Company, 730 Sheldon avenue, Columbus, O. These plungers have been tried out and are in use in a number of glasshouses and are reported by F. E. Miller to be giving very satisfactory results. They are made of tough and extremely close grained iron free from blow holes. They are designed to work at high temperatures and it is claimed will resist scaling when water-cooled.

The Miller Foundry Company was recently organized and are now operating an entirely new plant and equipment at the above address. They state that their pattern storage plant is one of the finest to be found in any foundry. The storage room is clean and dry and dampness is excluded. A card index system by which patterns which are stored on shelves may be located instantly. This method eliminates much of the risk of patterns being lost.

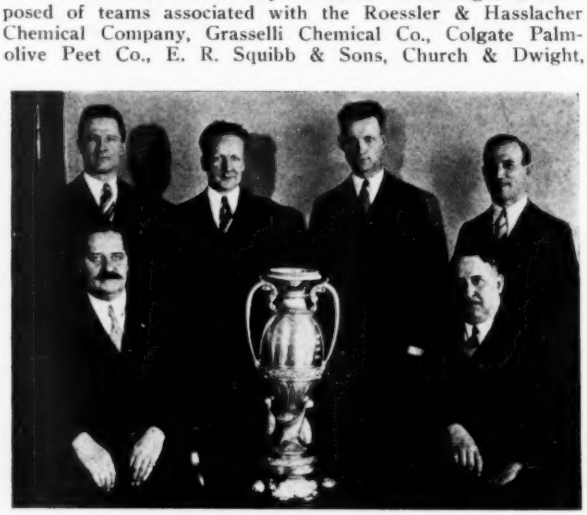
Edward Miller, known everywhere as the inventor of the Miller glassmaking machinery and head of the Miller Machine and Mold Works at Columbus, is president of the new foundry company. His long experience with glassmaking equipment will be of the utmost value to the new concern. Mr. Miller's son, F. E. Miller is in active charge of the foundry.

No Import Duty on Sodium Selenite

The Bureau of Customs has directed that sodium selenite imported into this country be given free entry under paragraph 1658 of the Tariff Act of 1922. Differences of opinion had existed as to the proper classification of this material. A report was submitted from the appraiser at New York stating that sodium selenite is a salt of sodium and a salt of selenious acid. It is also a salt containing selenium or in the broad sense of the commercial or trade understanding, a salt of selenium. In a report published by the United States Tariff Commission in Tariff Information Surveys in 1921, it is stated that selenium is used either in the form of a black amorphous powder containing 99% selenium or as one of its sodium salts (sodium selenite). The appraiser stated that in his opinion the provision in paragraph 1658 of the present act for "selenium, and salts of" was intended to cover sodium selenite as a salt of selenium. The Bureau of Customs concurred in the appraiser's view that sodium selenite should be classified as free of duty.

R. & H. Bowling Club Is Champion

After many decades of effort, the R. & H. Bowling Club has succeeded in winning the championship of the Wholesale Drug Trade Bowling Association for the season 1928-1929. The honor was closely contested. The league is composed of teams associated with the Roessler & Hasslacher Chemical Company, Grasselli Chemical Co., Colgate Palmolive Peet Co., E. R. Squibb & Sons, Church & Dwight,



R. & H. BOWLING CLUB,
Champions, 1928-1929

American Cyanamid Company teams No. 1 and 2, and Lanman & Kemp. The winning team was captained by Werner Malsch of the Ceramic Department, R. & H. Co. Mr. Malsch has been an ardent bowler for many years. Reading from left to right in the picture are Werner Malsch, captain, and George Bode; standing, from left to right, Henry Schumacher, Henry Nurge, William Friesendorf and George Stadta.

20 Mule Team Moves to New Quarters

The Pacific Coast Borax Co., manufacturers of the famous "20 Mule Team Borax," boric acid, and other boron products has announced removal of its offices to the new New York Life Building, 51 Madison Avenue, New York.

The Company has been engaged in the mining and refining of borax, boric acid and related products since 1872. Pioneering in the development of the vast borax deposits of Death Valley and other desert regions, the Company's growth has kept pace with the increasing consumption of borax in the household and in the industries. The story of the conquest of the desert with the famous 20 Mule Teams is one of the outstanding romances of the west.

The recent discovery of deposits of a new form of borax now being developed by this Company has given added impetus to the manufacture and consumption of borax products. In 1924, the Company built a new refinery at Wilmington, Cal., and the capacity of this plant has recently been greatly increased.

Now the 20 mule teams have been replaced by railroads

and Death Valley and its wonders are accessible to all who desire to visit it. A new high class tourist hotel, Furnace Creek Inn, offers excellent accommodations and it is situated on the rim of Death Valley overlooking the region through which the mule teams once wended their way.

Expansion of Triplex Safety Glass Company

Triplex Imperial, according to a report from U. S. Trade Commissioner Homer S. Fox of London to the Department of Commerce, is the name adopted for a new company being formed in England under the auspices of the Triplex Safety Glass Company, Ltd. An extraordinary general meeting of this company was held in London recently for the purpose of obtaining the shareholders' approval of an arrangement between the company and Pilkington Bros., Ltd., of St. Helens, Lancashire, the only plate glass manufacturers in Great Britain, who also claim to have the largest single plate glass works in the world.

The proposals, which were approved by the shareholders, include the formation of a company to be called Triplex Imperial, in which Pilkington Bros., Ltd., and the Triplex Safety Glass Co., Ltd., will have equal interests.

Tripex Imperial will be entitled to supply one-quarter of the demand for its safety glass in Great Britain and as much more as may at any time be beyond the productive capacity of the parent company's works, and in addition will give especial attention to colonial and Continental markets, where it will have the benefit of the Pilkington sales organization. It is also intended to form later an additional company under the title of Triplex Continental, to handle the Continental rights.

Austin Steam Plant Surveys Available

The widespread activities of the Austin Company of Cleveland, Ohio, in the construction of glass manufacturing plants is well known. The fact that they undertake complete projects even to the financing of legitimate enterprises is not new to the trade, but one phase of this organization's activities which is of interest to the glass manufacturing indsutry, as well as other industries, about which comparatively little has been published, is their Engineering Plant Reports.

The company states that this department of their business, especially in connection with industrial boiler and power houses, has become increasingly important. They point out that many of the glass manufacturers who have modernized their glassmaking plants to the point where they are strictly efficient and producing at low cost overlook the fact that important losses may be occurring in their boiler and power houses, which in some cases is a rather neglected department with which the executives are not as familiar as they are with glassmaking processes.

The Austin organization having been engaged for years in the designing and building of complete manufacturing plants in numerous industries throughout the country have had a particularly wide and valuable experience with boiler and power plants, and announce they are ready to undertake the making of steam plant surveys and submit reports that will give a true picture of existing conditions in the steam supply department of any glass factory. It frequently develops that where investigations of such plants are made by the Austin Company, serious losses are discovered and important economies effected.

Chinaware Manufacturers Combine

The organization of the American Chinaware Corporation composed of nine of the large pottery manufacturers of Ohio is of interest to the glass trade as showing the strong tendency in manufacturing industries to co-operate and combine. It is also of interest because of the close association of the chinaware trade with that of glass manufacturing in the distribution and selling branches of the trades. One primary purpose of the merger is the development of better china through the association of capable engineers, chemists, designers, stylists and modelists whose aim will be to create more beautiful and improved styles in American made chinaware. Col. J. T. Heckman was elected president of the new corporation on April 26. Mr. Heckman has been an executive for many years in the organization of Cheney Brothers, silk manufacturers. He was chief of the Supply Division and later chief of Ordnance Field Service during the war. He is a graduate of Lafayette College, post-graduate in chemistry of the Massachusetts Institute of Technology. Louis Porter, vice-president and sales manager, will be the director of the Chicago headquarters.

Vitaglass Corporation Report

The annual report of the Vitaglass Corporation, New York, on May 11 showed a substantial increase in 1928 over the 1927 sales. It was voted to increase the authorized common stock of the corporation from 50,000 to 100,000 shares non par common in order to provide for a possible later exchange offer to preferred stockholders for which approximately 40,000 shares of common would be required. The balance of common stock unissued would be held against possible need in connection with manufacturing in this country should that action be decided upon at a later date. The board of directors elected for the coming year is as follows: John H. Ballantine, vice president, Neptune Meter Co., New York; Walter L. Chance, chairman, Chance Bros. & Co., Ltd., Birmingham, England; Winthrop M. Crane, president, Crane & Co., Dalton, Mass.; F. Royal Gammon, vice president, Vitaglass Corporation, New York; Herbert Maynard, Jr., president, Maynard & Child, Inc., Boston, Mass.; Gardner B. Perry, president, Utilities Service, Inc., New York; Donald E. Sharp, glass consultant, Hamburg, New York, and Archibald R. Graustein, president, International Paper & Power Co.

Glass Sand Freight Rates Cut

The Interstate Commerce Commission on May 20 fixed the rate "not to exceed $1.95 a ton" on glass sand shipped from the Berkeley Springs, W. Va., and Hancock district in Maryland to New Kensington, Jeannette, Monongahela City, Belle Vernon, Springdale, Butler, Pittsburgh and Glassport, Pa. The American Window Glass Company and the Standard Plate Glass Company were complainants in the case against the Baltimore & Ohio, Pennsylvania, Western Maryland, Bessemer & Lake Erie and the Buffalo, Rochester & Pittsburgh railroads. The Commission found that the rates were not unreasonable prior to August 25, 1926 when the complaint was filed, but that since that date they were and are and for the future will be unreasonable to the extent that they exceed the rate of $1.95. The United States Glass Company which intervened in the suit was authorized to apply for reparation on the ground that by paying the maximum rate it had been damaged. About 15 other manufacturers also intervened in the suit.

Tyre Bros. Producing Laminated Glass

Tyre Bros. Glass Co., San Francisco, Cal., state that the new building which they are having constructed at Van Ness Avenue and Los Angeles Street, Fresno, Cal., will be used for warehouse purposes and not for the manufacture of laminated glass as reported. During the past five months the company has been manufacturing shatterproof glass in their San Francisco factory. They report success in producing a most satisfactory product. The company states that they will be glad to receive quotations, catalogs and full information from all manufacturers of materials and machinery used in the production of laminated glass.

New Partition Law in New York State

An important revision of the building laws in New York State went into effect when signed by Governor Franklin Roosevelt recently. According to Captain William Pedrick, executive vice-president of the Fifth Avenue Association, the use of dividing and subdividing partitions of wood, or of wood and glass for showroom and office purposes is now legalized in fireproof buildings equipped with automatic sprinklers. All rooms in which manufacturing is carried on, however, must be divided from the other sections by incombustible materials. Thousands of dollars will be saved to builders and to tenants of fireproof factory buildings equipped with automatic sprinkler systems by the new rules, which clears up a fourteen-year uncertainty as to the exact law regulating partitions.

Opportunity Offered for Young Man

An opportunity for a young man who is a college graduate and has had at least a little experience in technical work in connection with glassmaking is offered through Prof. Alexander Silverman, Head of the Department of Chemistry, University of Pittsburgh, by a Western glass manufacturing company which specializes in illuminating and tableware, pressed and blown glassware. Professor Silverman states that the accepted candidate upon proving his capability will be advanced gradually and eventually have charge of the illuminating ware department. Further particulars concerning the opening may be obtained direct from Professor Silverman at Pittsburgh.

April Construction Figures Second Highest on Record

New construction work contracted for in the territory east of the Rocky Mountains during the past month reached the second highest April contract total on record and was the largest monthly construction total that has been recorded since June, 1928, according to F. W. Dodge Corporation. Building and engineering work contracted for during the month of April in the 37 Eastern States amounted to $642,060,500. This figure was almost equal the April 1928 total and it was 32 per cent ahead of the March 1929 total.

Preparing for Carbonated Beverage Bottlers Convention

The annual convention of the American Bottlers of Carbonated Beverages with its exposition will be held at Atlantic City, Nov. 11-15. Many reservations for exposition space have already been made. Among bottle manufacturers who have already engaged space is the American Bottle Company, Chattanooga Bottle and Glass Manufacturing Company, D. O. Cunningham Glass Company, Graham Glass Company, Laurens Glass Works, Inc., F. E. Reed Glass Company, Root Glass Company and Three Rivers Glass Company.

Will Make Laminated Glass in England

The report has been confirmed that a subsidiary company to manufacture shatterproof glass of the type made by the Indestructo Glass Corporation, Farmingdale, L. I., has been organized. It is said that the new British company has obtained an exclusive license to manufacture the glass in England, Scotland and Wales and that it has acquired a site at Dagenham. Orders, it is said, have been placed for all presses and other hydraulic equipment. It is expected that the factory will be completed and production begun in July.

Tests for Fading Under Glass

The Bureau of Standards, Department of Commerce, in cooperation with American Association of Textile Chemists and Colorists, have during the past two years tested over 10,000 individual samples under exposure to various conditions of daylight and to carbon arc light. The tests are now practically completed and a preliminary report states that divergent results are obtained from tests made under glass set at various angles from the horizontal, and from glasses facing north and south.

New Packing Plant for Terre Haute

According to the *Tribune* of Terre Haute, Ind., a large Eastern food products concern will locate in that city, investing approximately a half million dollars in the packing industry. The proximity of glass container manufacturing plants to that city is said to have been one of the strong features in inducing the company to locate there.

Ultra-violet Ray Transmitting Glass for Senate

It is reported that Senator Copeland of New York has been instrumental in having ultra-violet ray transmitting glass specified for use in the Senate Chamber which later is to be enlarged. An appropriation for doing the work was made during the last session of Congress.

April Plate Glass Production

The production of polished plate glass for the month of April, 1929, was 12,554,979 sq. ft., as compared to 13,144,216 sq. ft. produced in the preceding month, March, 1929. The production for the corresponding month of last year, April, 1928, was 10,559,568 sq. ft.

To Conserve Fuel and Other Oils

A conference at Washington has been called by President Hoover for the purpose of considering the possibility of organizing an interstate compact for the conservation of oil.

Trade Activities

Bienenfeld Glass Works, Long Island, New York, have had plans made for a 100 x 180 ft. one-story warehouse.

The Dunbar Flint Glass Corporation, Dunbar, West Va., has an addition to its plant under construction.

The Hudson Glass Company has announced the closing of its New York office and removal to 69 River Street, Newark, N. J.

The Binswanger Plate Glass Company, Houston, Tex., are building a new two-story warehouse 90 x 130 ft., the estimated cost for which is $75,000.

J. C. Brady, chairman of the board, Hazel-Atlas Glass Company, Wheeling, W. Va., has been elected vice-president of the West Virginia Manufacturers Association.

C. W. Hemple, formerly with the United States Glass Company at Factory K, Pittsburgh, Pa., is now connected with the Beaumont Company, Morgantown, W. Va.

The Pittsburgh Plate Glass Company has declared a regular quarterly dividend of 50 cents a share payable July first on stock on record June 10.

The American Window Glass Company's factory No. 4 at Belle Vernon, Pa., is closing down the middle of June for cold repairs. Operations will be resumed in about six weeks.

The United States Glass Company, Pittsburgh, Pa., resumed operations during May in its factory at Glassport, which had been inactive for several weeks to permit ot tank repairs.

The Three Rivers Glass Company, Three Rivers, Tex., has taken over the plant of the Bastrop Glass Company, Bastrop, La., which had not been in operation for quite a long period.

Libbey-Owens Sheet Glass Company, Toledo, O., on May 10 declared the regular quarterly dividend of 50 cents per share on outstanding common stock payable June 1, 1929.

The Brown Instrument Company, Philadelphia, Pa., has moved their Boston office from 161 Devonshire Street, Boston, Mass., to 1107 Public Service Building, 89 Broad Street, in the same city.

Fredonia Flat Glass Company have, through the Wilmington Corporation Trust Company of America obtained a Delaware charter for a company capitalized at $150,000 with 2000 shares of common stock.

R. B. Tucker, president of the Standard Plate Glass Company, Pittsburgh, has resigned and is reported to have become associated with the Rust Engineering Company of the same city.

Johns-Manville Corporation, New York, announces the removal of the Milwaukee sales office of its Western Division to the Railway Exchange Building, 97 East Wisconsin Avenue, Milwaukee.

The Flaccus Glass Company's idle plant at Tarentum, Pa., was sold at a receiver's auction on May 16. Plant, property, stock and equipment were taken over by a broker, H. T. Rosemeyer of Pittsburgh, at a price reported as $48,900.

The Pittsburgh Plate Glass Company's new plant at Santa Ana, Cal., noted in the May issue, will include, it is reported, a main one story unit 400 x 2600 feet in size, a boiler plant, machine shop and other departments. The buildings will occupy the 80-acre site recently purchased by the company.

The Brown Instrument Company, Philadelphia, Pa., manufacturers of pyrometers and other instruments, recently announced the appointment of Charles H. Kerr as vice-president and general manager of the company and the appointment of George W. Keller as vice-president and general sales manager.

Jeannette Window Glass Company's bondholders, Point Marion, Pa., according to a report from Uniontown, Pa., began foreclosure proceedings on May 15 through E. E. Beardsley, the remaining trustee. Bonds amounting to $79,000 were due December 1, 1928.

The Central States Flat Glass Company, Toledo, O., which after installing new equipment was put into operation some weeks ago, was forced to shut down, according to the manager, S. McKittrick, being unable to continue because of lack of capital to take care of the payroll of about $3,500 a week.

The Hazel-Atlas Glass Company, Wheeling, W. Va., has commenced new building construction at its No. 2 plant, Zanesville, O., to be used as a fibre packing box factory. It is said that the cost will amount to $70,000. A new storehouse 100x120 feet, for glass, of brick, steel and concrete construction is nearly completed.

The Owens-Illinois Glass Company, Toledo, O., have absorbed the Graham Glass Company of Evansville, Ind., which had long been one of the subsidiaries of the Owens Bottle Company. The accounting department will be moved from Evansville to Toledo and consolidated with that of the Owens-Illinois Glass Company.

L. M. Albright, for the past ten years advertising manager of the Illinois Glass Company at Alton, Ill., and who was invited to fill the same position in the newly organized and consolidated Owens-Illinois Glass Company, resigned the position effective June 1, in order that he might go into business for himself at Baltimore, Md.

The Kadow Foundation, Inc., has been organized by August Kadow of Toledo, O., who for a long period had been chief engineer of the Owens Bottle Company and who is the inventor of numerous patented glassmaking devices, totalling it is said over 300 in all. The new organization recently moved to 2914 Sylvania Avenue, Toledo, and will continue the development and perfection of Mr. Kadow's inventions.

The Owens-Illinois Glass Company declared their initial quarterly dividend of $1 on common stock. A dividend of $3 on the new preferred stock dating back to January 1, was also declared. Both dividends are payable July 1 to stock of record of June 15. Sales organizations formerly controlled by the Owens Bottle and Illinois Glass companies have been merged in many cities in order to effect economies.

The Balmer-Westite Company of Weston, to manufacture glass, china and crockery, has been incorporated at the office of the secretary of state. The company was capitalized for 1,000 shares of no par value by M. B. Sprigg, Charles Smith and J. H. Brewster, of Weston; J. H. Balmer, of Maplewood, N. J.; E. A. Burwell, of Caldwell, N. J.; and D. L. Jones of Orange, N. J.

The Delay Manufacturing Company has sold its holdings at Naugatuck, Conn., and will move to Keene, N. H. The concern, which has been located at Naugatuck for the past few years engages in the manufacture of glass products and beveled glass mirrors. Albert Delay is president of the company. Operations will be resumed in the plant of Wilcox Comb Company at Keene. The Delay Company has taken over the Wilcox firm.

The Steubing Cowan Company, builders of lift and industrial trucks and skids, with general offices in Cincinnati, O., and plants in that city and in Holyoke, Mass., recently enlarged their Holyoke plant. Due to a marked increase in the demand for their product, they have found it necessary to triple their capacity and considerable new equipment has been added. So far this year all previous records have been smashed. They say that "shipping on skids" is becoming more universal.

The American Glass Works, Paden City, has taken out a West Virginia charter and will take over and expand the local glass manufacturing company of the same name. The capital is given as $100,000 and the incorporators are David Fisher, New Martinsville; Charles Ray, E. F. Schaffer, C. M. Garnet and Walter Smith of Paden City. It was recently reported that W. J. Reedy, formerly sales manager, had been named general manager and that J. N. Newmeyer had been appointed factory manager.

The American Association of Flint and Lime Glass Manufacturers Inc., has been changed to **American Glassware Manufacturers, Inc.** The officers of the new corporation are: C. M. Rodefer, president; Wm. T. Gillinder, 1st vice-president; George Dougherty, 2nd vice-president; E. P. Ebberts, treasurer; John Kunzler, actuary. These officers together with A. J. Bennett and C. B. Roe comprise the board of directors. John Kunzler, actuary of the old organization, will continue with the new organization.

H. P. Sinclaire Co. of Corning, N. Y., recently disposed of their glass factory at Dunkirk, N. Y., which had been idle for about two years after the death of H. P. Sinclaire, to the Gill Glass Products Corporation which will undertake the manufacture of several lines of glass products and specialize in street lighting and commercial illuminating glass. James P. Gill, formerly of Philadelphia, is president of the Gill Glass Products Corporation and Chas. E. Nicolia of the American Street Lighting Company of Baltimore is vice-president and secretary.

Coming Meetings

The Stained Glass Association of America will hold its annual meeting at Philadelphia on June 24.

The American Bottlers of Carbonated Beverages annual convention and exposition at Atlantic City, November 11-15.

Inquiries Received

457. We shall be glad to receive quotations and information from all manufacturers of materials and machinery used in the manufacture of shatterproof glass.

458. Please advise us as to whether glass accumulator jars are being made successfully by machinery in the United States.

459. As mentioned elsewhere in this issue Tyre Bros. Glass Co., 668 Townsend Street, San Francisco, Cal., desire to receive quotations, catalogs, etc., from manufacturers of materials and machinery used in the manufacture of this type of glass.

What the World Wants

Specific Inquiries for American Goods Received in the Department of Commerce, Washington, D. C.

Philippine Islands—38196, Glass bottles, jars, cheap tableware, and sheet glass.

Chile—38177, Window glass.

East Africa—38515, Cut glass.

Java—38568, Glass grinding equipment.

Canada—38638, Colored ground, coarse glass for stucco work; colored granules used for the general roofing trade; golden rock or travertine rock, and ground glass.

Glass Stock Quotations

PITTSBURGH STOCK EXCHANGE, MAY 22, 1929

Reported by Moore, Leonard & Lynch, Union Trust Bldg., Pittsburgh, Pa.

	Bid	Asked	Last
American Window Glass, Com.	..	..	..
American Window Glass, Pfd.	..	..	86
American Window Glass Mch., Com.	..	29	30
American Window Glass Mch., Pfd. Cum.	..	52	52
Pittsburgh Plate Glass, New	68	69½	68
Standard Plate Glass:			
Common	..	..	5⅞
Pfd. Cum.	..	..	21
Prior Pfd.	..	..	35
United States Glass	14	14½	14⅜

READERS' WANTS AND OFFERS

Search Light Glass Grinder and Polisher

WANTED for work in Europe, man thoroughly experienced and competent in grinding and polishing large search light glasses. Good references required. No others need apply. Address O-5, c/o THE GLASS INDUSTRY, 50 Church Street, New York.

Current Prices of Glass-Making Materials

May 22, 1929

Quotations furnished by various producers, manufacturers and dealers.

		Carlots	Less Carlots
Acid			
Citric (dom.)	lb.	.46	.46
Hydrochloric (HCl) 20° tanks, per 100 lb.		..	1.10
Hydrofluoric (HF) 60% (lead carboy)	lb.	..	.13½
52% and 48%	lb.	.10	.10-.11½
Nitric (HNO_3) 38° carboy ext. Per 100 lb.		5.50	5.75
Sulphuric (H_2SO_4) 66° tank cars	ton	15.50	
Tartaric	lb.		.38
Alcohol, denatured	gal.	..	.52
Aluminum hydrate ($Al(OH)_3$)	lb.	.04½-.05	.05½-.06
Aluminum oxide (Al_2O_3)	lb	..	.07
Ammonium bifluoride (NH_4) FHF	lb.	..	.21-.22
Ammonia water (NH_4OH) 26° drums	lb.	.02	.03½
Antimony, metallic (Sb)	lb.	..	.09⅜
Antimony oxide (Sb_2O_3)	lb.	..	.12-.14
Antimony sulphide (Sb_2S_3)	lb.	..	.14
Arsenic trioxide (As_2O_3) (dense white), 99%	lb.	.04	.05
Barium carbonate ($BaCO_3$)			
Precipitated	ton	57.50-59.50	60.00-61.50
Natural, powdered, imported	ton	45.00	50.00
Barium hydrate ($Ba(OH)_2$)	lb.	..	.04¾-.05½
Barium nitrate ($Ba(NO_3)_2$)	lb.	.08¼	.08½
Barium selenite ($BaSeO_3$)	lb.	..	..
Barium sulphate, in bags	ton	28.00-35.00	..
Barium sulphate, glassmaker's, carlots, bulk, f.o.b. shipping point,	ton	..	16.00
Bone ash	carlots, lb.	.06	.06½
Borax ($Na_2B_4O_7{\cdot}10H_2O$)	lb.	.02½-.02¾	.02¾-.03¾
Boric acid (H_3BO_3)	lb.	.05½-.05¾	.06-.07
Refined	lb.	.05½-.05¾	.06-.07
Cadmium sulphide (CdS)—			
Red	lb	..	1.20
Orange	lb.	..	1.00-1.25
Yellow	lb.	..	1.20-1.40
Chromium oxide (Cr_2O_3)	lb.	24	.25
Cobalt oxide (Co_2O_3)			
In bbls.	lb.	..	2.10
In 10 lb. tins	lb.	..	2.20
Copper oxide			
Red (Cu_2O)	lb.		.30
Black (CuO)	lb.	..	.25-.30
Black prepared	lb.	.	.30
Cryolite (Na_3AlF_6) Natural Greenland Kryolith)	lb.	.09	.10-.10½
Artificial or Chemical	lb.	..	.09½
Epsom salts ($MgSO_4$) (imported) Per 100 lb.		..	1.15-1.20
Feldspar—			
100 mesh	ton	11.00-20.00	15.50-22.00
80 mesh	ton	11.00-11.75	14.50
40 mesh	ton	11.00	13.50
Fluorspar (CaF_2) domestic, ground, 95-98% (max SiO_2 2½%)			
Bulk, carloads, f.o.b. mines	ton	32.50	
In bags or barrels	ton	36.50	41.50
Formaldehyde	lb.	..	.09½
Graphite (C)	lb.	..	.04-.07
Iron oxide—			
Red (Fe_2O_3)	lb.	..	.03¼-.03½
Black (FeO)	lb.	.03½	..
Kaolin (f.o.b. mine)	ton	9.00	..
English, lump, f.o.b. New York	ton	14.50-25.00	24.50-30.00
Kryolith (see Cryolite)			
Lead chromate ($PbCrO_4$)	lb.	..	..
Lead oxide (Pb_3O_4) (red lead)	lb.	.09½	.10½
Litharge (PbO)	lb.	.08½	.09½
Lime—			
Hydrated ($Ca(OH)_2$) (in paper sacks)	ton	11.50-12.50	..
Burnt (CaO) ground, in bulk	ton	8.00	..
Burnt, ground, in paper sacks	ton	10.00-11.00	..
Burnt, ground, in 280 lb. bbls.	Per bbl.	2.15-2.25	2.30-2.60
Limestone ($CaCO_3$)		2.00-2.50	..
Magnesia (MgO)—			
Calcined, heavy (in bbls.)	lb.	.06	.07
light (in bbls.)	lb.	..	.23
extra light (in bbls.)	lb.		.37
Magnesium carbonate ($MgCO_3$)	lb.	.06	.07
Manganese 85% (MnO_2)	lb.	.04	.04½
Nickel oxide (Ni_2O_3), black—			
for nickel content	lb.	..	.35
Nickel monoxide (NiO), green—			
for nickel content	lb	..	.35-.35½
Plaster of Paris, bags	ton	..	23.00-29.00
Potassium bichromate ($K_2Cr_2O_7$)—			
Crystals	lb	.09	.09¾
Ground	lb	.11	.12
Potassium carbonate—			
Calcined (K_2CO_3) 96-98%	lb.	.06½	.07
Hydrated 80-85%	lb.	.05¾	.06¼
Potassium chromate (K_2CrO_4)	lb.	..	.23-.32
Potassium hydrate (KOH) (caustic potash)		.07½	.08
Potassium nitrate (KNO_3) (gran.)	lb.	..	.05¾-.06
Potassium permanganate ($KMnO_4$)	lb.	.16	.16½
Powdered blue	lb.	..	.24-.26
Rochelle salts, bbls.	lb.	..	.23
Rouge	lb.	..	..
Rutile (TiO_2) powdered, 95%	lb.	.15-.20	.20-.25
Salt cake, glassmakers (Na_2SO_4)	ton	22.00	..
Selenium (Se)	lb.	..	1.90-2.00
Silver nitrate ($AgNO_3$)	(100 oz.) per oz.	..	.37½
Soda ash (Na_2CO_3) dense, 58%—			
Bulk, on contract	Flat per 100 lb.	1.22½	..
In barrels	Per 100 lb.	1.55-1.57½	2.40
In bags	Per 100 lb.	1.37½-1.40	..
Spot orders.. .025 per 100 lbs. higher			
Sodium bichromate ($Na_2Cr_2O_7$)	lb.	.07	.07½
Sodium hydrate (NaOH) (caustic soda) Solid	Per 100 lb.	2.90	..
Sodium nitrate ($NaNO_3$)—			
Refined (gran.) in bbls.	lb.	.03¾	.04½
95 per cent.	Per 100 lb.	2.22½	2.50
Sodium selenite (Na_2SeO_3)	lb.	..	2.35
Sodium fluosilicate (Na_2SiF_6)	lb.	.05	.05½
Sodium uranate (Na_2UO_4) Yellow or Orange	lb.	..	1.50
Sulphur (S)—			
Flowers, in bbls.	Per 100 lb.	3.45	3.80-4.00
Flowers, in bags	Per 100 lb.	3.10	3.45-3.65
Flour, heavy in bbls.	Per 100 lb.	2.85	3.20-3.40
Tin chloride ($SnCl_2$) (crystals)	lb.	.39	.37½
Tin oxide (SnO_2) in bbls.	lb.	..	.54
Uranium oxide (UO_2) (black, 96% U_3O_8)			
100 lb. lots	lb.	..	1.50-2.00
Zinc oxide (ZnO)	lb.	.08¼	.12
American process, Bags	lb.	.06½	.07
Zircon			
Granular (Milled .005-.02c higher)		.07	.07¼-.08
Crude, Gran. (Milled .005-.02c higher)		.03½	.04-.05

Monthly Summary of United States Foreign Commerce in Glass

EXPORTS

Corrected to April 24, 1929

	March 1928 Quantity	March 1928 Value	March 1929 Quantity	March 1929 Value	Three Months Ending March, 1929 1928 Quantity	Three Months Ending March, 1929 1928 Value	Three Months Ending March, 1929 1929 Quantity	Three Months Ending March, 1929 1929 Value
Glass and glass products (total)	.....	843,692	.....	988,277	.....	2,277,698	.....	2,724,017
Plate and window glass—								
Window glass, common, box 50 sq. ft.	1,972	12,304	1,127	9,166	4,239	27,497	3,902	24,579
Plate glass, unsilvered, sq. ft.	203,583	78,126	224,015	86,345	433,983	163,848	612,407	217,090
Other window and plate glass lbs.	232,604	34,099	673,611	62,473	857,286	113,063	1,247,669	129,803
Glass containers (bottles, vials and jars)	.....	261,865	.....	283,549	.....	751,002	.....	818,139
Table glassware, plain	.....	116,654	.....	133,390	.....	320,639	.....	368,358
Table and other glassware, cut or engraved	.....	11,398	.....	9,480	.....	29,604	.....	24,050
Lamp chimneys and lantern globes lbs.	133,768	30,784	127,968	30,401	487,723	99,916	407,609	89,426
Globes and shades for lighting fixtures lbs.	147,104	53,891	177,546	70,676	389,748	143,252	524,404	193,549
Chemical glassware lbs.	14,183	13,077	22,854	19,278	48,798	42,214	63,063	56,774
Electrical glassware, except for lighting lbs.	323,145	21,769	468,717	38,443	1,231,255	92,287	1,849,274	136,768
Other glassware	.....	210,125	.....	245,075	.....	494,376	.....	665,481

IMPORTS

Corrected to April 24, 1929

Glass and glass products	.....	1,193,151	.....	880,388	.....	3,225,633	.....	3,158,333
Cylinder crown and sheet—								
Unpolished, not bent, obscured, beveled, etc.—								
Weighing less than 80 pounds per case dut. lb.	3,589,931	92,752	3,662,438	101,952	8,946,035	256,263	9,759,780	262,197
Weighing 80 pounds or over per case dut. lb.	3,566,621	132,952	3,030,043	95,397	8,252,739	366,025	8,486,345	301,676
Polished and bent, obscured, beveled, colored, etc., unpolished and polished, and all silvered dut.	.....	32,190	.....	46,550	.....	106,215	.....	151,318
Plate glass—								
Polished, unsilvered dut. sq. ft.	1,535,968	335,479	198,802	48,887	3,619,745	783,277	3,413,843	733,941
Other dut. sq. ft.	77,275	19,853	127,330	21,651	279,262	66,491	304,918	62,912
Bottles, vials, jars, demijohns and carboys, molded or pressed dut.	.....	15,308	.....	20,756	.....	58,559	.....	74,495
Table and kitchen utensils dut.	.....	31,345	.....	15,475	.....	60,532	.....	51,592
Glassware, cut or decorated dut.	.....	209,755	.....	217,621	.....	586,405	.....	645,056
Blown glassware, n. e. s.—								
Bottles, ornaments, gauge glasses and other n. e. s. dut.	.....	69,370	.....	44,233	.....	197,481	.....	145,110
Bulbs for electric lamps dut. No. 1	1,072,315	12,199	2,000,225	13,368	3,341,156	35,299	6,032,858	44,965
Chimneys, globes, shades, prisms and other illuminating glassware dut.	.....	83,016	.....	92,422	.....	214,515	.....	248,330
Articles and utensils for chemicals, scientific, and experimental purposes dut.	.....	41,224	.....	45,650	.....	128,215	.....	122,804
Other glassware dut.	.....	117,708	.....	116,426	.....	366,356	.....	313,937